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RESEARCH UNDER NATIONALISATION

THE first research meeting of the Institution of Gas Engineers to be held under nationalisation—the fifteenth of its kind, however—was held in London on Tuesday and Wednesday of last week, and our report of the proceedings and of the research luncheon will be found on subsequent pages. It was made evident a year ago that those responsible for nationalisation work with a fundamental belief in the necessity for sustained research, both pure and applied. Through the years the Institution has proved its case for research, and we recall the remarks of the Minister of Fuel and Power a year and a half ago to the effect that the future would see a considerable extension of the research work carried out on carbonisation and gas-making. Six months later Sir John Anderson spoke of the country's dependence on the gas industry in times of war and in times of peace, and of how that dependence has been made possible through research and the imaginative outlook. There is no doubt that during the past 12 months the position of the Institution of Gas Engineers, co-operating with the Gas Research Board and the universities, has been strengthened; equally there is no doubt that similar comment applies to the sphere of education and training. In the period Institution membership has increased greatly and in this and in other ways its professional status has been enhanced The attendance at the meeting last week was excellent and under the presidency of Mr. C. H. Chester the proceedings went along with admirable vigour and enthusiasm. The research luncheon, always a distinguished gathering, was an enjoyable function though the speeches, to our mind, fell below customary standard.

At the outset of the meeting, Mr. Chester referred to criticism in past years on the over-organisation of discussions. We have had much to say about the gabbling of manuscript and its resulting tonelessness and lack of life and spontaneity. For the meeting last week the Council had arranged for one or two 'openers' on the various reports and papers in an endeavour to enliven the proceedings by giving opportunity to the impromptu speaker. To an extent the move met with success. It would have met with greater success, we think, if members generally had been told beforehand that this idea would be put into practice, for it was obvious that they were taken by surprise, being under the impression that all they would be called upon to do would be negative—to sit back and try somehow or other, as in previous years, to assimilate what the manuscript experts were getting at. However, we hope that we shall not return to the old over-organised plan even if, with the change, programme-timing is affected. As for the various papers and reports, this year they had greater practical flavour and in our opinion were more suited to a general assembly of the kind. Subsequently, we shall comment on specific items discussed at the meeting; in our present general remarks we feel impelled to offer a word of praise concerning the way in which Dr. J. Burns introduced his paper, the first to be presented at the meeting. His treatment of the subject was enjoyable and effective.

This year's report of the Chairmen's Technical Committee provided ample evidence of the great amount of exceedingly useful work carried out by the technical committees and was a pointer to the favourable position of the Institution, as a chartered professional body, in calling for and obtaining the collaboration of people of evidence in other spheres of activity. In one field alone, the formulation of Codes of Practice, the extent of the work is indicated by the circulation of 45,500 copies of the first series of gas code publications. The value of the activities of the Gas Works Safety Rules Committee was touched upon by Mr. E. Crowther, the immediate Past-President, in introducing the report; and he mentioned the interest of the National Coal Board in more than one of the committees dealing with carbonisation. There seems reason for believing that the collaboration of the Board, both technically and financially, could to advantage be sought in the work of the Safety Rules Committee and also of the Ammonia and Liquor Effluents Committee. As our pages during recent weeks have shown the effluents problem is one of great current interest and importance. On the matter of education, paramount, as we have mentioned, among the Institution's activities, there was lively discussion, some of it controversial. We shall return to this subject later, ending our present comment on the meeting by saying that it appealed to us being encouraging in its vigour and enthusiasm and satisfactory in that the major aspects of research and education are receiving practical support in growing measure.

Research

LAST week gas industry research workers gathered at the Institution of Mechanical Engineers under the Presidency of Mr. **C. H. Chester,** O.B.E., Chairman of the South Western Gas Board.

Formalities were expeditiously disposed of by the Secretary, who, for legal reason, had to explain that the meeting would be held. There followed a welcome to M. Brabant, who has endeared himself to us. He is the President of the International Gas Union, and he is encompassing his task with elegance. M. Brabant was accompanied by M. Towaide, Secretary of the Union; and the President of the Institution of Gas Engineers expressed the hope that they would benefit as a result of the meeting. We trust that our Continental friends went back to Paris not unduly depressed by the British research temperament. The Swiss Gas and Water Association sent greetings.

So we started the meeting, Mr. Edward Crowther presenting the report of the Chairmen's Technical Committee. He referred specifically to the work of the Codes of Practice Sub-Committee, mentioning a circulation figure of 45,500 copies, which fact indicates the value of the work. Mr. Crowther also spoke about district heating. On a quiet note—a note quiet enough to be disturbing—he said that the particular committee of the Institution dealing with this matter considered that district heating schemes would be found to be uneconomical In the meantime, of course, district heating schemes gain in popular esteem, even in the bleakness of the northern area. Mr. Crowther suggested that the National Coal Board might be prepared, if judiciously asked, to pay something in the interests of sewage disposal.

The President of the Institution, Mr. C. H. Chester, opens the Research Meeting.

There ensued a general discussion, with electrical de-tarring as the high light. Before the discussion started, Mr. C. H. Chester, President of the Institution, said there had been criticism that in the organisation of previous research meetings the discussions had been 'engineered.' Everybody knows that in this respect Mr. Chester hit a nail on the head.

Mr. John Terrace presented the 26th report of the Education Committee, and, to judge from the discussion which followed, we are, in spite of 26 years' endeavour, grossly uneducated. The youngsters these days (say the examiners) simply will not get down to scratch. Maybe the students look at the prospects and wonder whether such lengthy training —training which means five, six, or seven years out of an individual's span of life—is justified.

Following presentation of Institution Diplomas to the successful candidates in the 1949 examinations, the President presented N. R. Bowman with the Charles Hunt Memorial Medal and A. S. Greenway and L. Foster with James Archibald Maclay Memorial Prizes.

This brought us to the first paper to be presented at the meeting, that by Dr. J. Burns and Dr. F. R. Weston on the design of continuous vertical retorts of the rectangular type. Working on the quick-cooling investigational technique suggested by Dr. S. Pexton, success attended this method of examination of what happens to the coal charge on its way through the retort. With charges in two retorts (82 in. downwardly heated) at Bow Common, examination confirmed the very irregular manner in which Durham run-of-mine coal can travel through an 82 in. major axis retort. It was appreciated that, when making gas of calorific value of 500 B.Th.U. per cu.ft. and over, the coal core extends to within a few feet of the extractor, and it is essential to have an expanding cross-section as long as coal remains to be carbonised ; more so if it is highly swelling Durham coal. As a result of the observations made, the design for a new bench at Bow Common incorporated one main modification. where it was decided to introduce continuous minor axis taper from 10 in. at the top to 20 in. at the bottom. This same feature was incorporated in the new retort bench at Fulham put to work in 1948, although in one case the major axis of the retort was 82 in. and in the other 103 in. These latter dimensions were preserved to accommodate the existing ironwork.

The North Thames Gas Board has now had an opportunity of comparing the results obtained at Fulham with the results from the same retort house before the incorporation of continuous minor axis taper, and similarly the results obtained at Bow Common on two benches with and without continuous minor axis taper. The results obtained at Fulham are more revealing, as the retort house there operates on Durham run-of-mine coal as against Yorkshire run-of-mine coal at Bow Common.

Essential variations in the results on the reconstructed plant at Fulham are summarised as follows : (1) Coal travel is more regular. (2) The efficiency of gas making, as measured by hydrocarbon enrichment value determinations, is higher, showing an increase to 34.5 from 31.3. (3) The calorific value of the gas produced, under similar operating conditions, is increased to 560.5 B.Th.U. per cu.ft. from an average figure of 512.2. (4) The thermal output from the plant is as high, and on a strictly comparative basis is likely to be higher than before. (5) There are no essential differences in the net yield of coke, but the bulk density of the coke is lower.

An overall summary of the results obtained is as follows: The improvement in coal travel is beneficial as it allows a better standard of working conditions for men, and over a period of time this smoother coal travel should give a higher throughput of coal between resettings, leading to lower charges for repairs and maintenance per therm of gas made. The high calorific value of gas allows a higher thermal output from the station, as the gas of high calorific value has got to be diluted with blue gas or producer gas down to the declared

calorific value of 500 B.Th.U. per cu.ft. Further, this high calorific value gives the board a greater degree of flexibility in the practice of benzole extraction should economic conditions allow. The cost of coal gas as made in the retort house is less from the new plant than the old plant.

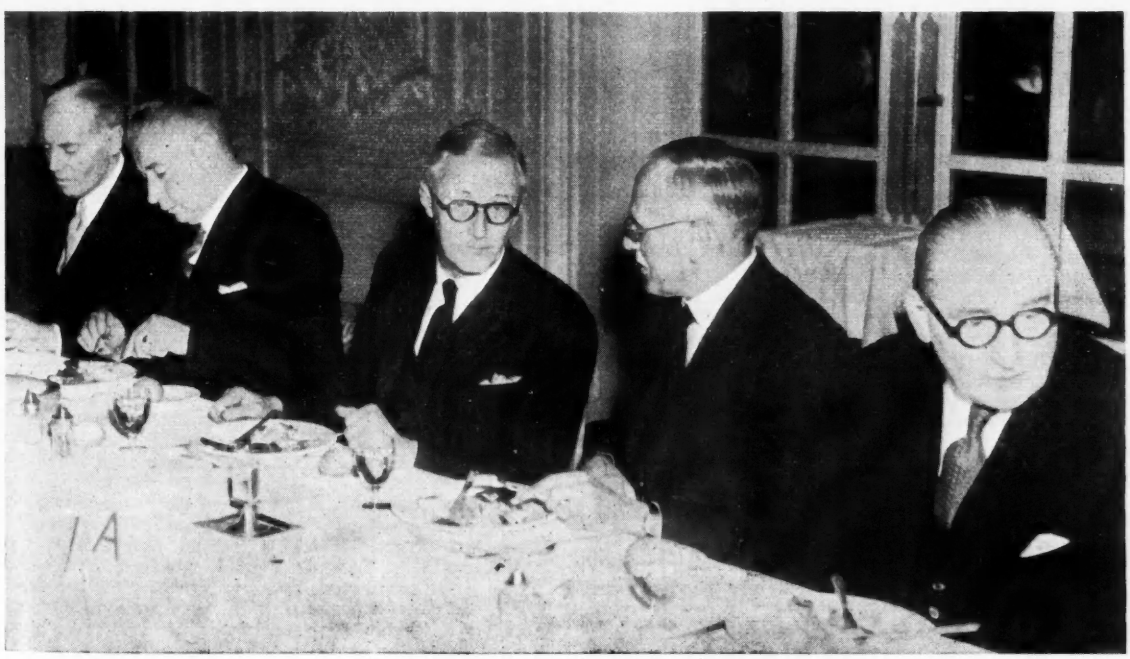
Due to the high ratio of the price of coke to coal the cost of production of blue water gas is higher than the cost of coal gas at the present time, and this affects adversely the cost per therm of gas at 500 B.Th.U. made from this rich coal gas by dilution with blue water gas. A further conclusion set out in the paper is that the gas of high calorific value made in the reconstructed setting is of value in reducing the amount of oil used at times when carburetted water gas is required to meet the board's gas-making schedule, and at these times the cost per therm of gas of a calorific value of 500 B.Th.U. per cu.ft. made from the lean coal gas from the old setting with the addition of blue gas and oil is higher than the cost of similar gas from the new setting.

Major axis taper along with continuous minor axis taper is to be re-introduced in the retort house now on order for the Kensal Green station. A taper of 6 in. from 6 ft. 4 in. to 6 ft. 10 in. on the major axis is incorporated for a distance of 15 ft. down the retort, and it is hoped that this will result in even smoother coal travel, and will give the opportunity of studying, among other things, the effect of varying the physical state of the coal substance fed to the retort, on the lines obtaining in coke oven practice at the present time.

When the meeting was resumed on the Tuesday afternoon, a paper on 'Electro-detarring' was presented by K. W. Francombe, of Whessoe, Ltd., in which the author outlined the basic principles of operation of this means of removing tar fog from fuel gases, giving an expression by which efficiency may be related to plant design. This was followed by a discussion on the application of the basic principles to the design of commercial installations. The main characteristics of the system are given in the paper: moderate cost, high efficiency, low pressure loss, low power consumption, good overload capacity. The purposes of electro-detarring are given, which may be summarised as the improvement in the operating efficiency of all unit processes which follow the electro-detarrer. The author pointed out that, as electro-detarring plants are nearly always sited before the ammonia scrubbers, the fillings of such scrubbers are not contaminated with tar, and in the case of static ammonia scrubbers now usually employed the recirculating liquor is maintained free from tar. Accordingly, the wetting of the fillings is more complete and uniform and this has an important bearing on the efficiency of ammonia removal and the periodic cleaning of the fillings for the removal of pitchy deposits is eliminated. When the semi-direct process of ammonia recovery is practised, as in the coke oven industry, the sulphuric acid saturators are maintained in a clean condition, free from tar, and accordingly a much whiter salt is recovered.

Again, there is the importance of high-efficiency tar-fog removal on the operation of oxide purifiers for the removal of sulphuretted hydrogen. However, while it is unquestioned that complete tar-fog removal prior to the purifiers is essential for the efficient operation of such purifiers, it does not follow that the oxide will not cake or harden in the absence of tar fog. The author mentioned the improved operation of primary condensers, which will remain in clean condition when preceded by a hot gas detarrer; a good quality creosote will also be recovered from such condensers. He also remarked that the installation of an electro-detarrer tends to increase the yield of saleable tar recovered from the gas.

The problem of effluents disposal from gasworks is much to the fore, and on the Tuesday afternoon the meeting had before it a survey of the problem by E. H. M. Badger, North Thames Gas Board. The author gave an account of the polluting matter in gasworks liquor and of the methods of measuring pollution. He discussed means for improving the quality of the liquor to be discharged, maintaining that in general the simplest and most satisfactory method of disposal is for gasworks to make a controlled discharge to the sewers of a liquor containing the minimum quantities of this cyanate and polyhydric phenols, and from which the free ammonia, sulphide, and cyanide have been removed by distillation. Mr. Badger



The President's table at the Research Luncheon. Left to right: Lieut.-General Sir Ronald Weeks; the President, Mr. C. H. Chester; Professor E. B. Moullin, President of the Institution of Electrical Engineers; Lord Falmouth; and Mr. F. M. Birks, Senior Vice-President of the Institution of Gas Engineers.

added, however, that in some cases further purification may be either necessary or desirable.

Whatever the decisions affecting ultimate policy which might be taken, remarked the author, it is unlikely that the Ministry of Health would force a local authority to accept a quantity of trade waste which was greatly in excess of its present purification capacity. Some solution, other than the normal one, would have to be found, even if it were only temporary. If dephenolation were carried out, it might be possible to dispose of a larger volume of liquor than otherwise, though it is more important to remove the polyhydric than the monohydric phenols.

The author gave the operating costs of a dephenolating plant at Beckton for 1948—a plant which treats nearly 100 mil. gal. of gasworks liquor a year. The plant was built before the great increase in capital costs, and the result has been that the process has been profitable. A present problem in regard to the erection of plant is steel allocation. Experimental work aimed at reducing the amount of steel needed has given satisfactory results on the small scale.

Fluidised Technique for Sulphur Removal

Two papers were presented on the Wednesday morning, both being concerned with the purification of gas from sulphuretted hydrogen. The first dealt with an application of the fluidised solids technique, the work being carried out by R. H. Williamson (Research Fellow of the National Gas Association of Australia) and Dr. J. E. Garside (Gas Research Board). The first part of this investigation was reported a year ago, when the following advantages of the process were put forward: Continuity of operation; higher rates of reaction; reduced labour requirements; possibility of recovering sulphur in a pure form. On the other hand, more purifying material might be needed and also higher inlet gas pressures.

The process comprised reactor and regenerator vessels in which the normal sulphiding and oxidation reactions would proceed independently of one another. Thus, powdered iron oxide would be entrained by the foul gas stream and carried into the reactor, wherein it would be maintained in a fluidised condition. The sulphiding reaction would proceed in the reactor, from which partly spent oxide would be withdrawn continuously and conveyed by air into the regenerator where, in a second fluidised bed, oxidation of the sulphide would occur. The revivified oxide would be withdrawn continuously from the regenerator, entrained by the foul gas stream, and returned to the reactor, so completing the cycle. Provision would be made also for the steady withdrawal from the regenerator of some of the revivified oxide, and for its replacement by new oxide, so as to preserve continuity at maximum efficiency of the process as a whole.

Such a process has now been developed in the laboratory to the stage when, using an active form of iron oxide, complete and continuous removal of hydrogen sulphide from a nitrogen stream containing it can be achieved. One feature of the process is that no air is admitted prior to hydrogen sulphide removal, so that, compared with box practice, both the oxygen and inerts contents of the purified gas would be reduced. On a large scale, however, this advantage would be largely offset by the fact that both capital and running costs of the plant would be approximately twice those of a unit in which the sulphiding and oxidation reactions proceeded simultaneously in one and the same fluidised oxide bed.

Accordingly, a study has been made also of a process in which both reactions are carried out in a single fluidised bed of iron oxide. An apparatus had been developed which effects continuous, complete removal of hydrogen sulphide from a nitrogen stream containing it, while retaining all the advantages of fluidisation itself. Provided that fresh oxide be added at a low steady rate to the fluidised bed, the latter should retain its reactivity to hydrogen sulphide indefinitely, while spent oxide of a constant sulphur content may be withdrawn from the bed at an equivalent rate. The actual concentration of sulphur in the spent oxide may be increased up to, say, 50%, by resorting to two-stage purification with counter-current operation, and, given a satisfactory fluidised method of extracting that sulphur without impairing the reactivity of the oxide, the process might well become sensibly self-sufficient in oxide.

If the two processes can be shown ultimately to operate equally satisfactorily on crude coal gas, either would seem to be particularly adapted for peak-load plant.

Hardening of Oxide

A second report on the hardening of oxide in purifiers was presented by Dr. F. J. Dent and Dr. L. A. Moignard. The report discusses the causes of hardening in the absence of tar, light oils, and other extraneous materials. It is concluded that hardening depends upon the migration of iron oxide and sulphide, in the presence of moisture, towards the points of contact between particles. The next stage involves the development of a continuous cellular structure covered with a dense skin of iron sulphide consolidated with sulphur. The initial migration results in the iron oxide assuming a high activity and is not, in itself, undesirable. It is the subsequent formation of the dense skin which gives rise to hardening, and this can be prevented or delayed by maintaining moisture in the oxide, by controlling the use of revivification air, and by avoiding overheating in the boxes.

In keeping a film of moisture on the oxide difficulties become more pronounced as gas throughputs are raised or when oxide of higher activity is used. As is pointed out in the report, the exothermic purification reactions result in continuous evaporation of moisture from the beds of oxide, and replacing it depends mainly upon water being supplied as a mist in the gas entering them. Mist can be produced by steam injection, but this procedure is limited, particularly in hot weather, by the danger of overheating and then reliance must be placed upon the mist produced by the cooling of the gas in contact with the lids and bases of boxes and in inter-connecting mains. The cooling and mist formation which occur as the gas traverses a series of boxes are of first importance for satisfactory operation, but, in practice, cooling is usually most haphazard. Not all the mist produced by cooling enters the oxide, and there are considerable losses as drainage. There is, in addition, the difficulty of ensuring the distribution of the moisture over the oxide layers and through their depth, and excess moisture collecting on top of the bed gives rise to back pressure. Moreover, the whole problem is aggravated by a reluctance of the surface of the oxide to wet properly when sulphur and tar have been deposited upon them. It should, however, be possible to indicate some measurement which will show whether the moisture content is being maintained, together with the manner in which operation can best be modified if it is not. It is in this direction that the study of the caking of oxide will be continued, and it may be necessary to use wetting agents and internal water sprays before adequate control is obtained under some conditions. Large-scale tests aiming particularly at moisture control are now being put in hand.

The report also describes the first part of an investigation of the recovery of sulphur from spent oxide, mainly by means of organic solvents. It is emphasised that sulphur of the high degree of purity demanded can be most simply produced when deposition of tar in the boxes has been prevented. It has been found that the activity of the extracted oxide can be extraordinarily high if conditions in the purifiers have been controlled so that 'blue' formation and over-heating do not interfere. In the light of the results obtained, the operation of extraction processes on gasworks appears promising, especially if the performance obtained in the boxes is enhanced as a result of the highly active residues. These oxides also appear suitable for use in specially designed high-capacity purifiers at times of peak load.

For the meeting this year there was a welcome change in the make-up of the report of the Refractory Materials Joint

Committees. The change consisted in presenting the broad issues of two of the research projects and recording only briefly what else has been done in the composite programme. We have pressed for something of this nature for many years.

One of the researches described at length concerns the durability of carbonising refractories in continuous vertical retorts. Flaking in the top half of the continuous retort is one of the main factors responsible for retorts being withdrawn from service. It has long been considered that flaking is connected with the scurfing operation, but until laboratory work simulating scurfing was actually begun this suggestion remained in the realm of conjecture. It has now been shown that the deposition of carbon on the surface and in the pores of silica bricks produces important physical changes accompanied by a permanent dilation of the specimen and a serious reduction in strength. Burning-out of the carbon has actually led in certain cases to surface flaking of the specimen. Examinations of numerous retort settings have provided additional data on the problem of flaking, and in this connection there are important differences between the flaking tendency of British and French retorts which at present cannot be entirely accounted for by differences in working temperature and technique. This in turn has led to a close study between the properties of English and French silica bricks partly traceable to differences in the nature of the silica rock.

Conclusions reached as a result of the foregoing research are set out in the report :—

(1) The rate of scurf formation varies directly with temperature up to 1,100° C. for a given concentration of scurf forming compounds.
(2) Carbon can penetrate into all the cracks to which a liquid would be expected to gain access, such as the boundaries between individual cristobalite crystals in a silica grain. There is no evidence, however, that carbon actually enters the silica lattice in the same way as it enters the iron lattice in the cementation process.
(3) Cooling of carbon impregnated silica and siliceous specimens has been found to introduce a state of strain in the material when cold, since it does not behave as a perfectly elastic material. It is inferred that a similar strained condition may result from temperature variations during retort operation.
(4) Some evidence has been given to indicate that growth of the refractory may occur as a result of carbon deposition, under conditions of fluctuating temperature.
(5) It has been found under certain conditions of preparing a specimen that flaking of the surface can be simulated in the laboratory.

Insulating Materials

The other item of research detailed was on refractory insulating materials. Recent work has been concerned with the validity of the 2 hr. reheat test as a means of predicting the shrinkage of insulating bricks. It has been shown that the 2 hr. shrinkage figure bears no relationship to that produced over longer periods, though the shrinkage-time curves make it possible to predict the ultimate shrinkage of the brick. Tests on commercial bricks have indicated that the initial contraction temperature is a guide to the upper limit of volume stability ; above this temperature appreciable shrinkage will usually occur. An interesting though disturbing discovery has recently been made in regard to the shrinkage of insulating bricks. Measurements of the length changes in the heated face of bricks forming a furnace wall (actually the door of the furnace) have shown that the shrinkage of a small piece of the brick heated under uniform conditions bears no apparent relation to the behaviour of the hot face when a temperature gradient occurs through the brick as in a furnace wall. Under these latter conditions it is possible for the hot face to register an expansion in contrast to the considerable shrinkage when pieces from the same brick are heated uniformly to the same temperature. This discovery, the report points out, opens a wide field for research.

In connection with work on insulating materials a new thermal conductivity apparatus has been built employing peripheral heaters to ensure a straight-line heat flow. With this apparatus the thermal conductivity of refractory materials at mean temperatures as high as 1,050° C. can be measured.

Methane Synthesis

The final technical item on the agenda of the meeting was a paper by Dr. F. J. Dent and Dr. D. Hebden on the catalytic synthesis of methane as a method of enrichment in town gas manufacture. Semi-scale experiments have shown that at atmospheric pressure with gas of a composition similar to blue water gas a final gas of 500 B.Th.U./cu.ft. is made. At 20 atm. with a hydrogen-rich gas a final gas of 700 B.Th.U. is made. Catalyst cost in each case, 0.3d. a therm.

Synthesis is suggested as an alternative to oil for the enrichment of blue water gas at times when the maximum thermal output of gas is not required from the water gas plant. With oil costing 10d. per gal., there is a margin in the cost of raw materials in favour of synthesis of approximately 1.75d. per therm, and this margin becomes 2.6d. with oil at 12d., and 3.9d. with oil at 15d. per gall. It should be sufficient to cover the installation and operation of the synthesis plant. Synthesis can, therefore, be regarded as a method of conserving the supply of oil for its most important use—namely, at times of peak load—if there should be reason to restrict the overall consumption. The authors contend that the erection of a full scale plant is justified to provide more precise economic data.

The second application of synthesis is for the enrichment of gas produced by the gasification of coke breeze at moderate pressure with oxygen and steam. In circumstances where breeze can be made available in sufficient quantity (150 to 200 tons per day), its gasification under pressure, the authors conclude, is particularly attractive, the low price of the breeze offsetting the cost of the oxygen required. The process should produce gas at least as cheaply as carbonisation, and it would be more flexible. It would absorb satisfactorily all the coke breeze produced and allow the breeze to be supplemented by supplies of weakly caking slack coal. It is believed that the adoption of the process would be of considerable national importance, since it would reduce materially the dependence of gas manufacture upon supplies of high quality coals and oil.

Votes of Thanks

Mr. G. H. Fuidge said he felt sure everyone would agree that they had had a most successful meeting, as had been evident from the very full attendance, as well as the excellent discussions at all sessions. It therefore gave him great pleasure to propose a vote of thanks to all those who had been concerned. They had received a number of important reports from committees and very valuable papers of a high standard on a wide range of subjects connected with the production and purification of gas. These papers had stimulated the excellent discussions and members were exceedingly grateful to the authors. They must also thank the Institution of Mechanical Engineers for their courtesy and hospitality in making available so excellent a theatre and the accompanying facilities.

The reports and papers were the outward manifestation of a very considerable amount of work ; there were therefore many who shared in the credit for this successful meeting. Among them were the Gas Research Board and Leeds University under whose direction a very large part of the research work of the gas industry was carried out. They were particularly indebted to Dr. King, Dr. Dent, and the staff of the Gas Research Board for their inspired work. Research work was also carried out and facilities were provided by many individual members and undertakings and to them also thanks were due for their help. A professional institution, he continued, was dependent for its success on the voluntary work of the members of its various committees. The Institution was very fortunate indeed in the work that had been done on its committees. Finally, it was a pleasure to include in the vote the Secretary of the Institution, Dr. Braunholtz, and his staff, and, of course, the President and Dr. Hollings.

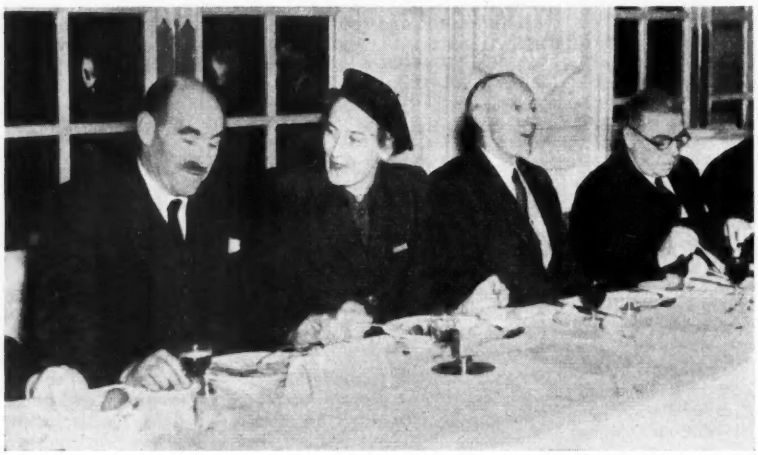
Dr. A. Marsden supported the vote, and thanks were expressed by Mr. Chester and Dr. Braunholtz.

A Clear Duty

The Professional Factor in Industrial Development

THE Fifteenth Research Luncheon of the Institution of Gas Engineers, attended by a distinguished company of public men, representatives of overseas associations, Government departments, the Gas Council, research associations, universities, and kindred organisations, was held at the Savoy Hotel on November 29, the President, Mr. C. H. Chester, O.B.E., in the Chair.

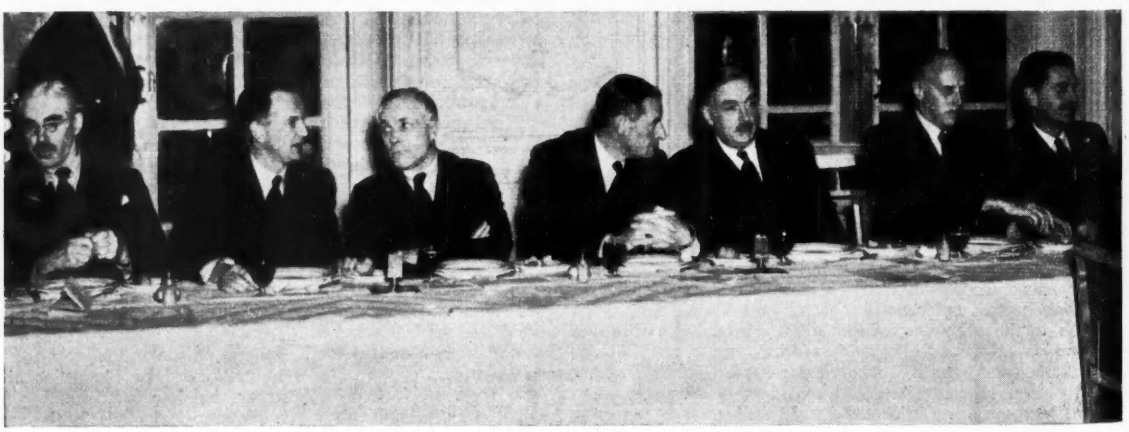
The **President** proposed the toast of 'The Guests,' with which he coupled the name of Lieut.-General Sir Ronald M. Weeks, K.C.B., C.B.E., D.S.O., M.C., T.D., Chairman of the National Council on Education for Industry and Commerce. He said it was customary at the autumn research meeting of the Institution to take the opportunity of thanking those who had given service to the Institution and its members in matters of research and education. There were present students who had distinguished themselves during the year, and to whom it had been his privilege to present diplomas. They would realise that their education was foremost in the mind of the Council of the Institution. There were present teachers, examiners, and assessors in the examinations of the Institution. He hoped that soon the Institution would be called upon by the Gas Council and the area boards to give further assistance in the wider field of education which was opening up. The Institution had a duty, as the Gas Council and the area boards had a duty, to arrange facilities for education in the gas industry. In the future they would have to take a wider view of manufacture and distribution and they would have to play a greater part in organised research. And in honouring the toast of the guests they could not forget the valuable assistance which the University of Leeds in particular gave to the Institution of Gas Engineers. Leeds might be considered to have been the home of the graduate gas engineer; and that was not to decry the great contribution given by the other universities. They had a special regard for Leeds, with its Livesey Professorship, and he was very glad to see their old friends Dr. Roberts and Mr. Hodsman. They had also with them representatives of the Ministry of Education who had given freely of their services in guiding the training of the juniors. There were also present Sir Edgar Sylvester and the chairmen of various area boards, representatives of the National Coal Board, led by the Chairman, Lord Hyndley, and Sir Charles Ellis, scientific member, and representatives of many learned societies.



At the Research Luncheon. Left to right: Professor D. M. Newitt, President of the Institution of Chemical Engineers; Miss K. M. Halpin, President of the Women's Gas Council; Sir Harry Lindsay, Director, Imperial Institute; and Sir John Stephenson, Chairman of the Eastern Gas Board.

Application Lagging

Lieut.-General Sir **Ronald Weeks**, K.C.B., replying, said that many of the guests were the chairmen of research associations; others were engaged in pure research. He was not so much worried about the facilities which existed today for teaching research or for subsequent post-graduate work, but he felt that its application was undoubtedly lagging behind. He was Chairman of the new National Advisory Council on Education for Industry and Commerce which was set up last year, whose job was to advise the Minister of Education on technical education. It did not take him long to find that he was trying to steer the ship through tricky waters. Universities, technical colleges, local authorities, teachers, and industrialists had conflicting views on the methods by



Left to right: Sir Alfred Egerton; Mr. T. Mervyn Jones, Chairman, Wales Gas Board; Professor G. M. Bennett, Government Chemist; Mr. O. R. Guard, Chairman, Southern Gas Board; Sir Charles Ellis, National Coal Board; Sir Wallace Akers; Mr. Michael Milne-Watson, Chairman, North Thames Gas Board.

which technical education should be given in this country. Comparisons were made by various people with systems in operation in Holland or Switzerland, or Germany, or the United States of America. We in this country, however, had never specialised in vast technical establishments like those in Massachusetts or Zurich, although some of our colleges were large and served a wide region. The majority of our 470 colleges and similar establishments, however, were comparatively small and widely scattered.

There had been a series of committees —the Percy Committee and the Barlow Committee, the Institute of Physics, the F.B.I., the Parliamentary and Scientific Committee, and the Scientific Advisory Board, all of which had produced recommendations on the future conduct of the technical colleges and the type of award to be made. There was no disagreement on certain fundamentals, such as the provision of a limited number of super-technicians and a lifting of the standards of teachers and students in technology. But, as he saw it, the National Council had a nettle to grasp, and he hoped a solution could be reached.

Friendly Greetings

Professor **E. B. Moullin,** M.A., SC.D., M.I.E.E., President of the Institution of Electrical Engineers, proposing the toast of 'The Institution of Gas Engineers,' said his Institution was happy to have the opportunity to express through him their warm feelings for the Institution of Gas Engineers and to send them its good wishes. He went on to say that an outstanding function of any institution was to supervise the standards of individual professional competence and of professional practice. When they were founded on professional qualifications they were a device for compromising rationally between unrestricted personal liberty and unrestricted compulsion, and thus were an important factor in maintaining a state of civilisation. Viewed in that way they were seen to have a considerable degree of international status. Western Europe appeared to be veering away from the ideals of the professions and tending towards centralised administration. If the administrators got too jealous of the professions, or too overwhelmingly numerically, then external conditions would swamp the professional institution because the call would be for technical specialists to act as advisers to administrative boards. None could tell how far this tendency to break away from professionalism in favour of administratism would go.

Mr. **F. M. Birks,** C.B.E., M.I.C.E., M.I.MECH.E., Vice-President of the Institution of Gas Engineers, replying to the toast, said he would like to put in a plea for greater collaboration in certain matters between the Institution of Gas Engineers and their electrical friends, whether by means of research or committees. There were today in both industries a number of people who were aware of the danger in taking the space heating load which was not only economically but physically almost impossible to meet at certain times. He suggested that for the benefit of both industries they should together consider the implication of other loads, the effect of which might be at first sight less obvious than that of space heating. There was every tendency for the gas industry to use more and more electricity for power and lighting and in doing so to depend on the national grid. This was a national problem ; but at the moment he spoke in the interests of the gas industry, and it seemed to him that some of the work they had done in that direction might be a guide against taking on loads which eventually could only lead to the intermittent breakdown of supplies. May 1 brought a change to the set-up of the gas industry and this would be reflected in the Institution. There were already marked signs that changes would come about. Discussions had taken place with the District Associations up and down the country and there was every hope that it would be possible to incorporate those Associations as District Sections of the main Institution. The whole position of the Institution and the provincial bodies would be greatly strengthened thereby, and with the valuable work, particularly in education, which the Institution was able to carry out, its value and prestige would be considerably increased.

Mr. **E. Crowther,** Immediate Past President, proposed the toast of 'The President,' saying they would wish to thank Mr. Chester for the felicitous manner in which he had presided. In filling the office of President of the Institution and that of the Chairman of an area board at the same time, Mr. Chester carried no mean burden. But Mr. Chester's shoulders were broad and he could carry the tasks.

The **President,** replying to the toast, said he was grateful to Mr. Crowther for his encouragement and inspiration.

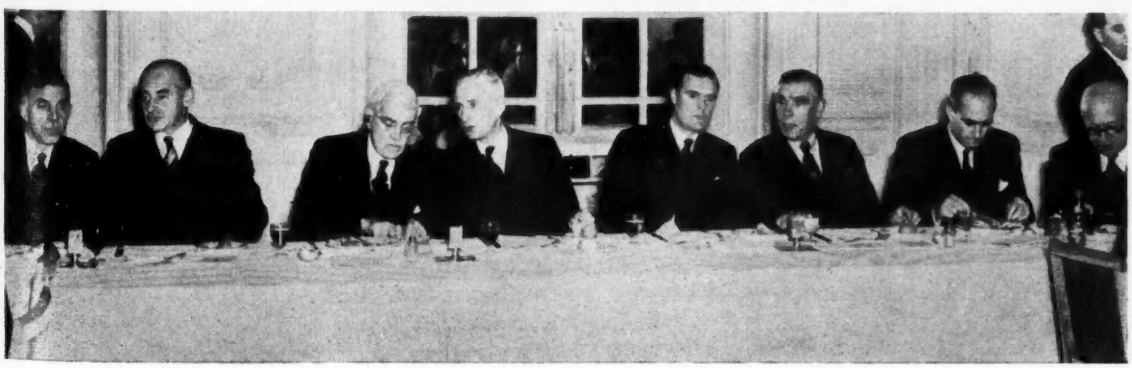
Awards

As mentioned on a previous page, Mr. Norman Reginald Bowman, of Stretford, was, at the Institution research meeting on Tuesday morning, presented with the Charles Hunt Memorial Medal for 1949. Prior to the presentation, which was made by Mr. C. Holmes Hunt, Mr. Chester expressed on behalf of the Institution, sincere gratitude to Mr. Hunt for a very handsome increase in the capital endowment of the medal by the sum of £500.

MR. N. R. BOWMAN.

Mr. Chester presented James Archibald Maclay Memorial Prizes for 1949 to Albert Stanley Greenway (Birmingham), Gas Engineering (Manufacture) ; and to Leonard Foster (Birmingham), Gas Engineering (Supply).

In addition to Mr. Bowman the following successful candidates were presented with Diplomas (Manufacture) by the President : Roland Piling (Calcutta), 1st Class ; John Charles Britton (Hereford), 2nd Class ; Stanley Charles Crathorn (Birmingham), 2nd Class ; Eric Ivor Messenger (Aberdeen), 2nd Class ; Garrick Henry Potter (Birmingham), 2nd Class ; Arthur Geoffrey Pratt (Ipswich), 2nd Class ; John Henry Welsh (Birmingham), 2nd Class. A Diploma in Gas Engineering (Supply) was presented to Wilfrid Brown (Falkirk), 2nd Class.



Mr. F. W. Smith, Deputy Secretary, Ministry of Fuel and Power; Mr. G. le B. Diamond, Chairman, West Midlands Gas Board; Sir William Larke; Mr. H. F. H. Jones, Chairman, East Midlands Gas Board; Mr. J. H. Dyde, Deputy Chairman, Eastern Gas Board; Mr. F. H. Reid; Mr. W. K. Hutchison, Chairman, South Eastern Gas Board; and Lord Limerick, Vice-President, Gas Research Board.

Personal

Mr. **M. Pool,** on the Manchester staff of Donald Macpherson and Co., Ltd., has been appointed Sales Manager on the gas side of the Company under Mr. W. A. Lowe, Director in charge of decorative and gas sales.

Mr. **George Horrocks,** retiring Northern Sales Manager of Richmonds Gas Stove Co., Ltd. (Radiation Ltd.), was recently presented with a gold wrist-watch and a portable wireless set, a gift from the directors of the firm and his former colleagues. Making the presentation, Mr. W. D. King, Chairman of the Company and a director of Radiation Ltd., said that Mr. Horrocks had served the industry well, both by creating an atmosphere of confidence and service between the firm and its customers and by contributing his wisdom and long experience to the development of appliances.

Obituary

Mr. **C. J. A. Galloway,** Director and London Works Manager of Keith Blackman, Ltd., died on November 24, in his 66th year. Mr. Galloway served the Company loyally and efficiently for 36 years. He became London Works Manager in 1930 and was given a seat on the Board in 1945. The funeral, at Northaw, near Cuffley, on November 30, was attended by the Directors, representatives of the Tottenham works and office staff, and outside business associates.

Mr. **James Jamieson,** C.B.E, former Engineer and Manager of the Edinburgh undertaking, died on December 4. Mr. Jamieson had a lifelong connection with the gas industry which he entered at Thornliebank under his father, whom he ultimately succeeded as Manager, a position which his grandfather had also held. He was later transferred to the Dalmarnock station of the Glasgow Corporation, and held appointments as Assistant Engineer and Manager to the Dunfermline Gas Commissioners and Greenock Corporation Gas Department. He was appointed Assistant Engineer and Manager at Edinburgh in 1921, and was promoted Engineer and Manager in 1933, a position he held until his retirement in 1947. He was a Past-President of the Scottish Junior Gas Association (Western District), and of the Waverley Association of Gas Engineers. He was also elected President of the Institution of Gas Engineers in 1943, being the first Scotsman to be appointed to that office since 1911. The annual meeting in 1944, his year of office, was to have been held at Edinburgh, but war circumstances, particularly the preparations for 'D' Day, necessitated its cancellation. In the same year he was appointed Regional Gas Engineering Adviser for Scotland. Among his other honorary appointments were those of Chairman of the National Gas Council for Scotland, Chairman of the Regional Gas Engineering Advisory Board, and Chairman of the Co-operative Tar Scheme. He was a Fellow of the Royal Society of Edinburgh, and received the C.B.E. on his retirement two years ago.

1949 'Journal' Directory

A new edition of the *Gas Journal* Calendar and Directory will be published at the end of the year and sent to subscribers in the usual way. For the benefit of readers who may wish to keep their 1949 edition up-to-date, the following corrections which have been notified during the past month, are published:

Page 24.—CROYDON: Delete W. A. Bishop, *Comm M,* retired.
„ 32.—GLOUCESTER: Delete F. W. Rogers, *S & Acct,* retired.
„ 42.—KETTERING: Delete J. F. Lord, *GM.*
„ 44.—LEAMINGTON SPA: D. K. Green, *GM & E,* vice R. S. Ramsden, retired.
„ 48.—LYMM: B. H. Harrison, *E.* vice T. H. West, retired.
„ 68.—SOUTH METROPOLITAN: Delete A. H. Andrews, *CE & WM,* retired.
„ 70.—STRATFORD-ON-AVON: Delete D. K. Green, *E & M.*
„ 86.—ANNAN: Delete H. Robinson, *E & M,* retired.
„ 92.—HADDINGTON: F. B. Oliver, *E & M.*
„ 96.—ST. ANDREWS: Delete G. Bruce, *E, M & S,* retired.

Diary

Dec. 7.—Manchester District Junior Association of Gas Engineers: Visit to B.E.G.W.A.C.O. Meter Works, Farnworth. Short Papers for F. Johnson Prizes.

Dec. 8-10.—National Poultry Show, Olympia. Cookery Demonstrations at The Gas Council Stand No. 12A (Ground Floor), National Hall, and display of home laundry equipment.

Dec. 9.—London and Southern Junior Gas Association: Short Paper Meeting, Lecture Theatre, 178-180, Edgware Road, W.2. 7 p.m.

Dec. 9.—Northern Junior Gas Association: Short Paper Meeting for President's Prize, Middlesbrough.

Dec. 12.—Midland Junior Gas Association: Joint Meeting with Wolverhampton and District Engineering Society. Films on Oil. Victoria Hotel, Wolverhampton. 7.30 p.m.

Dec. 14.—Southern Gas Consultative Council: Social Welfare Club, Reading and District Gas Undertaking, Gasworks Road, Reading. 2.30 p.m.

Dec. 14.—London and Southern Junior Gas Association: Visit to Neasden Works of Ascot Gas Water Heaters, Ltd.

Dec. 16.—Scottish Junior Gas Association (Western District): Dinner, Dance, and Presentation of Medals and Awards. Cadoro Restaurant, 120, Union Street, Glasgow.

100 YEARS AGO

In 1849, as today, the price of gas drew forth considerable comment. When Charles Pearson and Alexander Angus Croll announced the proposed formation of the Great Central Gas Consumers' Company which, it was claimed, would supply gas at 4s. per 1,000 cu.ft., or 2s. less than the two companies then supplying in the City, public opinion was firmly behind them. On December 3 and 7, special meetings of the Commissioners of Sewers for the City of London considered all aspects of the matter during a lively debate. Much doubt was cast upon the new company's ability to fulfil its promises. 'Have we any certainty,' asked a Mr. L. Taylor, 'that the gas to be manufactured will ever reach the City? Will those who have the superintendence of the roadways out of the City raise any obstacle?' When informed by Mr. Deputy Harrison that the company had permission on a line of railway, he remarked that: 'That is a novel line of transit for gas, and my friend Mr. Deputy Harrison himself seems to be going at railway speed, contrary to his usual cautious manner of travelling.'

'A Novel Line of Transit'

EASTERN ASSOCIATION CONFIDENT OF SUCCESS

THE Autumn General Meeting of the Eastern Association of Gas Engineers and Managers was held at the Waldorf Hotel, London, on November 25 under the Presidency of Mr. C. E. Grimwood (Sudbury), who welcomed Mr. J. H. Dyde, Deputy Chairman of the Eastern Gas Board; Mr. F. M. Birks, Senior Vice-President of the Institution of Gas Engineers, Major C. Hyde, Under Secretary, Ministry of Fuel and Power, Mr. J. T. Brookes and Mr. H. R. Hilham, President and Secretary of the Eastern Junior Gas Association. Apologies for absence were received from Mr. C. H. Chester, President of the Institution; Sir Edgar Sylvester, Chairman of the Gas Council; Sir John Stephenson, Chairman of the Eastern Gas Board; Mr. H. F. H. Jones, Chairman of the East Midlands Gas Board; Mr. S. Smith, Deputy Chairman, East Midlands Board; Mr. R. Kelf Cohen and Mr. J. S. Smith, of the Ministry of Fuel and Power.

The meeting expressed its sorrow at the death of Mr. J. Croxall (Witham) who had retired in 1932 and had reached the age of 83.

Resignations were received from Messrs. W. C. Chapman (Boston), past President, Secretary and Treasurer, 1932-37; J. A. Derbyshire (Ilkeston); F. Harvey (Bilston); V. E. Harston (Norwich); E. Hutchinson (Worksop); G. A. Mallett (Ipswich); also from the following Associates: Messrs. E. W. King (Elland); J. H. Kemp (Weaverham); and E. W. Bonsey (Hull).

One new member was elected—Mr. R. G. R. Wallis (Halesworth).

Mr. J. Hunter Rioch (Cambridge) and Mr. R. A. Weston (Norwich) were appointed scrutineers for the ballot to be taken at the spring meeting.

At the invitation of the President, Mr. **F. M. Birks** presented certificates to six students from the Association's area who had been successful in the 1949 Institution examinations.

Presentation to Mr. Allen

The **President** then presented Mr. F. Allen (Clacton-on-Sea), the Immediate Past-President, with a silver plated tea service as a mark of appreciation of his services to the Association during his year as President. He thought Mr. Allen's Presidency would long be remembered as outstanding in the history of the Association, and particularly the successful meeting held at Clacton in the spring.

Mr. **Allen** expressed hearty thanks for the presentation and assured his successor that he could wish him nothing better than that his year of office would prove as enjoyable as his own had done.

On the proposition of Mr. **R. A. Weston,** seconded by Mr. **F. A. Rhead,** it was unanimously agreed to make the usual donation of £30 to the Benevolent Fund of the Institution.

Mr. **Grimwood** then presented his Presidential Address (which was published in the *Journal* of November 30, pp. 530-537.)

Mr. **W. J. Collins Garrard** (Ipswich Division) proposed a vote of thanks to Mr. Grimwood for his address. They had been urged to practise decentralisation, and in the Eastern area they were all pulling together and were confident of success. He was glad to see Mr. Grimwood's father present at the meeting; he had retired earlier this year after having served the industry for a period of 65 years. He had also been asked to convey the greetings of Mr. G. A. Mallett who, like Mr. Grimwood senior, had 65 years' service to his credit. The Sudbury undertaking had a proud record extending over 113 years and before nationalisation the directors had shown great foresight in placing an order for one of the most up-to-date plants in the country. He was looking forward eagerly to the erection of that plant.

Mr. **H. R. Thomas** (Bury St. Edmunds) seconded the vote of thanks, to which Mr. Grimwood briefly replied.

The **President** then gave a brief report as the Association's representative on the Council of the Institution.

Educational Activity

Mr. **R. C. Wardell,** Chairman of the Eastern District Gas Education Committee, presented a report on the work of the Education Committee of the Institution of Gas Engineers as well as that of the District Committee. He recalled that a new syllabus for the Associateship examination was published just over a year ago and considerable interest was being taken in the examination, candidates for which would be accepted from the spring of 1951. In order that students who had already embarked on a course of studies for the Ordinary and Higher Grade certificates under the 1945 regulations might complete their course it would be possible for them to be examined in the Ordinary Grade up to the spring of 1950 and the Higher Grade up to the spring of 1952, with one year's extension for both examinations in certain cases.

The second examination for the Certificate in Gas Salesmanship and Consumer Service was held in May, and while the number of entrants was small it must be realised that it was a three years' course and normally a candidate would not come forward until 1950. Several colleges were conducting courses for the certificate and it was anticipated that the number of candidates would gradually increase.

As far as the District Education Committee was concerned it had been a disappointing year. Very few enquiries for courses of study had been received from students and for that reason the Committee had been unable to get any classes started in gas engineering subjects. Gas fitting was the bright spot on the horizon and classes were being held throughout the area. The problem of training in the Eastern area was a real one, and one solution would seem to be the adoption of a policy of part-time release so that all who wished to receive training would attend courses of study at selected centres. Under the Gas Act every area board was required 'in conjunction with any organisation appearing to them to be appropriate, to make provision for advancing the skill of persons employed by them' and it might well be that something on the lines suggested would be adopted at a not too distant date. The future of the Education Committee was uncertain but its members would be happy to render whatever assistance they could to the two area boards covering the area of the Association.

The President thanked Mr. Wardell for his report and in closing the meeting announced that the spring meeting would be held somewhere in the Ipswich Division; more precise details would be issued later.

A Slight Fall in the weekly output of coal was recorded last week. Production of 4,472,700 tons was 46,400 tons less than in the previous week when the highest output of the year was attained. Manpower declined by 200 in the week ended November 19, including the loss of 100 face workers, and now stands at 708,400, compared with 723,700 at this time last year. Gas available at gasworks last week totalled 11,373.6 mill. cu.ft., against 11,368.9 mill. in the week before; the total for the first 47 weeks of this year being 464,507.3 mill. cu.ft., against 448,488.3 mill. in the same period of 1948. Approximately 1,034.2 mill. units of electricity were sent out last week for public supply, against 1,012.2 mill. in the previous week.

A new mobile laboratory is now in use in the Exeter Sub-Division of the South Western area. The laboratory operates throughout the district for both production and distribution and is a means of ensuring that both works staff and consumers have available an efficient technical service. On the left is a picture of the interior, while the photograph on the right gives an impression of the distinctive external appearance of the laboratory when on the road.

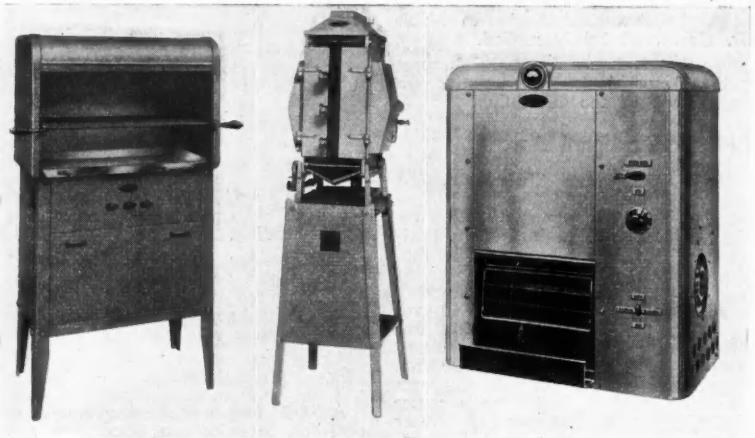
Infra-Red Cooking

Demonstration at the Building Centre

AT the Building Centre, London, on Thursday last there was a demonstration of infra-red cooking by gas, an event attended by a large gathering representing all phases of the gas industry. The appliances, which we illustrate here, provoked great interest. They are fitted with surface combustion burners, combustion taking place below the surface of refractory material or porous plaque. The application of heat in this way has been developed by Mr. Arthur Docking, of Radiant Heating, Ltd.

The appliances are designed for large scale catering, and the Earl of Limerick, who introduced the demonstration, emphasised that they mean a fillip to the country's export business. They are being exported to the United States of America, to the Argentine, Brazil, France, Belgium, Spain, Canada, Switzerland, Germany, and Japan.

Shown in our composite photograph is a salamander in vitreous enamel, fitted three radiant plaques each using 60 cu.ft. of gas per hour. This appliance is suitable for steaks, crops, sausages, canapes and re-heating or browning of cooked dishes. Also shown is a griller having radiant plaques arranged in opposition so that steaks, &c., are grilled both sides simultaneously. Each plaque uses 105 cu.ft. of gas per hour. The appliance has a cooking capacity of 200 steaks an hour. The third appliance is a toaster in anodised aluminium. Toast is placed on a rotating track and discharged when ready into a tray. The gas consumption is 40 cu.ft. per hour. The appliance is thermostatically controlled and will toast 540 rounds of bread per hour.



On the left is shown the high-speed salamander fitted with three radiant heat plaques. The centre photograph is of a vertical type griller. The plaques face each other and steaks, chops, &c., are cooked on both sides simultaneously in four minutes. With this shape griller a number can be fitted side by side, economising kitchen space. The photograph on the right is of a three-track radiant heat toaster. Gas consumptions of these appliances are, respectively, 180 cu.ft., 210 cu.ft., 40 cu.ft. an hour.

The gas and air mixture heats porous ceramic plaques composed of large and small granules. In a matter of seconds the plaques reach a working temperature of 1,400° F. The even radiant heat ensures good cooking, and the appliances are extremely speedy in operation. The infra-red griller which which we illustrate will, for example, cook 200 steaks per hour. The radiant efficiency is nearly 70%, with consequent economy in gas consumption.

The North Eastern Gas Consultative Council is now accommodated at the headquarters of the North Eastern Gas Board, Bridge Street, Leeds, 2. (Telephone: Leeds 32571/4.)

A Broadcast Talk on the North Thames Gas Board's by-products was given to Scandinavia in the B.B.C. Norwegian Service on November 17. The talk followed a visit to the tar and ammonia works by the correspondent who gave a similar broadcast picture of Beckton gasworks in September.

Regulations have been Issued by the Minister of Fuel and Power amending the Gas (Meter) Regulations, 1949 (b). The section which relates to the fees to be paid to the Minister for the examination of meters is altered by the addition at the end of paragraph (1) of regulation three of the words 'or the sum of 20 pounds, whichever is the less.' The amendment has the effect of fixing a maximum fee of £20 for the examination of any one meter. The Gas (Meter) Regulations with this modification came into operation on December 1.

East Midlands Prices

The East Midlands Gas Board has published the following list of changes in the price of gas within its area.

The board believes that the new prices are still highly competitive with other fuels, both for domestic and industrial purposes. In the list below the figures in brackets denote the previous prices.

The revised maximum prices in each case were submitted to the East Midlands Gas Consultative Council, who concurred in the necessity for the increases.

Increases in Price

Sheffield and Rotherham Division.

Hathersage, 18.5d. (17.2d.); Penistone, 18.5d. (16.0d.); Sheffield, 10.25d. (9.575d.); Stocksbridge, 10.5d. (9.2d.); Tideswell, 18.5d. (18.0d.); Cudworth, 14.0d. (12.0d.); Wombwell, 13.0d. (11.78d.); Misterton, 19.0d. (18.8d.) (lighting and cooking); Clowne, 18.5d. (16.8d.); Beighton, Dinnington, Maltby, Bawtry, 11.0d. (10.0d.); Doncaster, 11.5d. (9.625d.); East Retford, 16.5d. (13.75d.); Rawmarsh, 13.0d. (11.4d.); Rotherham, 10.25d. (10.0d.).

Notts and Derby Division.

Clay Cross, 13.0d. (11.87d.); Shirebrook, 13d. (11.79d.); Shirland, 13.0d. (12.5d.); Chesterfield, 12.5d. (11.75d.); Mansfield, 13.0d. (9.26d.); Derby, 10.0d. (9.25d.); Long Eaton, 11.0d. (10.75d.); Ripley, 11.0d. (10.5d.); Ashbourne, 18.0d. (16.2d.); Burton, 17.0d. (15.5d.); Ilkeston, 13.5d. (11.0d.); Bingham, 18.0d. (14.0d.); Riddings, 17.5d. (15.75d.); Newark, 14.0d. (13.68d.).

Leicester and Northants Division.

Great Wigston, 15.0d. (13.33d.); Leicester, 15.0d. (14.8d.); Ashby-de-la-Zouch, 18.0d. (16.25d.); Lutterworth, 17.5d. (16.5d.); Measham, 18.0d. (17.89d.); Melton Mowbray, 15.0d. (13.5d.); Uppingham, 20.0d. (18.4d.); Loughborough, 15.0d. (14.5d.); Market Harborough, 17.5d. (15.0d.); Desborough, 16.0d. (14.2d.); Finedon, 16.0d. (15.3d.); Kettering, 12.5d. (11.33d.); Northampton, 18.0d. (16.75d.); Rushden, 16.0d. (12.6d.); Stony Stratford, 18.5d. (17.2d.); Wellingborough, 16.0d. (14.0d.); Rothwell, 16.0d. (15.4d.).

City of Lincoln Sub-Division.

Gainsborough, 14.5d. (13.778d.); Lincoln, 11.5d. (10.74d.).

North Lincs Sub-Division.

Alford, 22.0d. (20.6d.); Barton, 18.0d. (16.0d.); Grimsby, 11.5d. (9.8d.); Louth, 14.75d. (12.58d.); Mablethorpe, 20.0d. (17.2d.); Spilsby, 22.0d. (20.0d.); Woodhall Spa, 20.0d. (18.5d.); Brigg, 19.0d. (18.44d.); Horncastle, 24.0d. (23.3d.).

South Lincs Sub-Division.

Boston, 15.0d. (12.0d.); Bottesford, 20.0d. (19.2d.); Grantham, 16.0d. (14.4d.); Kirton, 20.0d. (18.0d.); Stamford, 13.0d. (12.5d.); Bourne, 16.0d. (13.778d.); Spalding, 17.5d. (16.5d.).

Decreases in Price

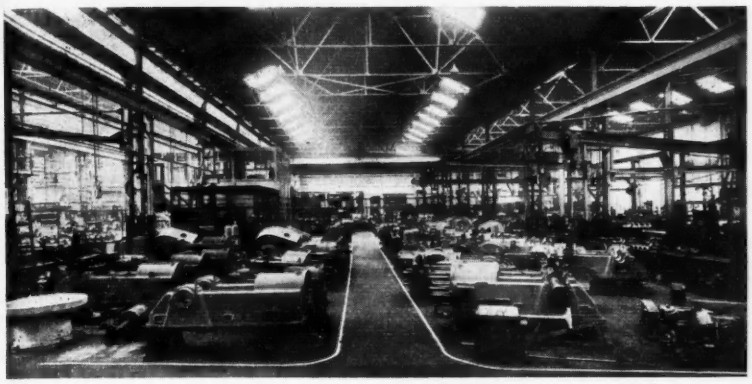
Sheffield and Rotherham Division: Misterton, 19.0d. (20.0d.); Epworth, 19.0d. (20.0d.) (where lighting only). *Leicester and Northants Division:* Ibstock, 16.0d. (23.6d.); Sileby, 15.0d. (15.55d.) *City of Lincoln Sub-Division:* Kirton-in-Lindsey, 22.0d. (24.0d.). *North Lincs Sub-Division:* Barrow-on-Humber, 22.0d. (26.0d.); Caistor, 22.0d. (28.0d.); Winterton, 22.0d. (22.2d.). *South Lincs Sub-Division:* Long Sutton, 18.5d. (21.05d.).

Eastern Juniors at Lincoln

Members of the Eastern Junior Gas Association visited Lincoln on November 2 for a tour of some of the works of Ruston and Hornsby, Ltd. The first factory to be inspected was the Boultham works where oil-engined locomotives and one range of Ruston medium size, high speed vetrical oil engines are produced. After a visit to the machine shops, the party moved to the narrow gauge locomotive erection line. Here they saw under construction narrow gauge oil-engined locomotives for service in all parts of the world, and particular interest was shown in the mine locomotives.

The party then saw the shunting locomotive line where machines varying between seven and a half and 28 tons were in course of erection. They then had an opportunity of driving the finished products on test tracks, and those whose first occasion it was to drive a machine expressed surprise at the simplicity of control. Another section in the works in which 3- and 4-cylinder engines were being erected and tested was also inspected.

A tour of the boiler works included an inspection of hydraulic presses, bending rolls, hydraulic riveters, automatic welding machines, X-ray equipment, test house, and a large stress relieving furnace which is fired with town gas and is capable of accommodating a vessel 8 ft. in diameter and 41 ft. long.



A general view of the horizontal engine assembly lines.

In the welding department the members saw a stainless steel vessel measuring 4 ft. in. diameter and 100 ft. long, which was nearing completion. The welded joints in this vessel had been subjected to X-ray examination for which work a qualified radiologist is responsible, and a few members of the party had an opportunity of viewing the X-ray negatives. As distinct from pressure vessels the party also viewed the fabrication of a variety of light plate work such as steel ducting. and chimneys.

The final visit was to the Anchor Street works, one section of which is devoted to the manufacture of fuel injection equipment. The visit concluded with a tour of the inspection department and an inspection of completed fuel pumps and atomisers.

Before the party left the works the President, Mr. J. T. Brookes, gave a vote of thanks to the Company for the opportunity of seeing the production of such a diverse range of heavy engineering products. Mr. Sleightholme, Locomotive Sales Manager, replied.

Members of the Eastern Junior Gas Association outside Boultham Works. In the centre is Mr. J. T. Brookes, President, and on his right (pipe in hand) is Mr. H. R. Hilham, Secretary.

Mobile Showroom for the South West

These photographs were taken during the inspection of the new mobile showroom inaugurated by the South Western Gas Board. The group on the left comprises Mr. J. Carr, General Manager of the Northern Division; Mr. E. R. V. Porter, O.B.E., Deputy Chairman of the South Western Gas Board; the Sheriff of Bristol; Mr. C. H. Chester, O.B.E., Chairman; Mr. A. W. Grant, C.B.E., Member of the Board; and Mr. Noel S. Smith, Distribution Engineer. On the right is shown the interior of the showroom, with a compact yet widely varied display of water heating and cooking appliances. The showroom is similar to that introduced in the summer by the South Eastern Gas Board, described and illustrated in the JOURNAL of August 17 (p. 427).

Referring to the photographs of two London County Council civic restaurants published in the *Journal* of August 24 and subsequent references in our issues of September 14 and November 30, the Hygienic Stove Co., Ltd., informs us that the captions relating to the 'Drayton' and the 'Gilpin' kitchens were erroneously transposed. While the information given in the paragraph on page 521 of last week's issue was correct in so far as the 'Drayton' was concerned, the majority of the equipment installed at the 'Gilpin' was manufactured by the Hygienic Stove Co., Ltd., and supplied by Rowe Bros. & Co., Ltd., and consisted of two 'Windsor' food steamers, two 'Lincoln' hot cupboards, one two-pan 'Frygienic' frying range, two 'Universal' boiling pans, and one 'Dual' boiling pan.

The Address of the Huddersfield-Halifax Group, North Eastern Gas Board, is now Group Head Office, Leeds Road, Huddersfield. (Tel: Huddersfield 6680-5.)

Meters in the Making

Last month about 60 members of the Midland Junior Gas Association, with the President, Mr. S. C. Bentley, visited the Coventry works of George Wilson (Gas Meters), Ltd.

Midland Juniors at the Coventry works of George Wilson Gas Meters, Ltd. Left to right: Mr. R. B. Watkins (Junior Vice-President of the Midland Gas Association), Mr. F. C. Wilson, and Mr. F. A. C. Pykett (Coventry undertaking).

Owing to damage sustained at Coventry on four occasions during the war, the main manufacturing section of the firm is at Jarrow, but there was ample in the work done at Coventry to prove of great interest. It included the assembly, calibration, testing, and paint spraying of ordinary and prepayment meters and the repairing of defective meters. Mechanisms of various prepayment attachments were examined and special attention was given to the firm's patent bi-coin attachment with a compensating cam designed to allow the prepayment cam to travel beyond the closed position, without damaging the meter transmission, when gas passes a closed shut-off valve for any reason or if a supply to by-passes or refrigerator is required.

The Rutten valve for preventing gas passing to burners inadvertently left open was demonstrated, also an experimental device dispensing with an autovalve by automatic displacement of the meter valve timing. Further experimental work on plastic diaphragms, flexible stuffing boxes, air heaters, and automatic toasters called for comment.

The party also visited the Ministry of Fuel and Power Midland (No. 2) Division, meter testing station.

Afterwards the visitors were entertained at tea and were welcomed by Mr. **W. D. Wilson,** Managing Director.

Proposing a vote of thanks to their hosts, Mr. **Bentley** commented on the research work which Wilson's had in progress and suggested that with meter prices controlled by the manufacturers' association and purchasers amalgamated by nationalisation the firms which would obtain the business were those which devoted the greatest amount of thought to design and showed the best craftsmanship. He thanked Mr. B. Good, the Chief Meter Inspector, for the facilities extended at the meter testing station.

Mr. **J. Palser**, Senior Vice-President, seconded the vote.

Modern Test Kitchen

Miss Elizabeth Craig, the well-known cookery expert, has created a new service for her readers by installing in her house a fully-equipped kitchen. Planned on modern lines to minimise work for the housewife, it will give Miss Craig opportunity to test all the equipment under working conditions.

Included in the gas appliances selected are a Radiation New World gas cooker and a set of Phantom gas irons. These irons, also manufactured by Radiation Ltd., are operated as a pair and allow the one iron being used to be flexless. The principle, as shown in the picture, is to heat one iron on the gas trivet, transfer it to the stand and place the other iron on the trivet to be heated while the first is being used. By this means the irons are kept in continuous use and are easy to handle without a flex restricting the area of the ironing board.

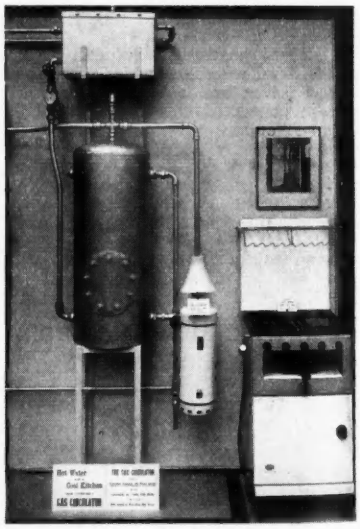
Miss Craig also has in her test kitchen a Portcullis gas fire for comfort in the very cold weather.

Gloucester Profit Sharing and Saving Scheme

The 41st annual report and accounts of the profit sharing and saving scheme established by the Gloucester Gas Light Company in 1908, covering the period ended June 30, records that in accordance with the Gas (Co-partnership) Regulations a bonus of 2% on salaries and wages was payable, the total bonus amounting to £1,941. There were 349 members of the scheme on June 30, the same number as at the end of the previous year, 36 withdrawals, and 36 new employees being recorded.

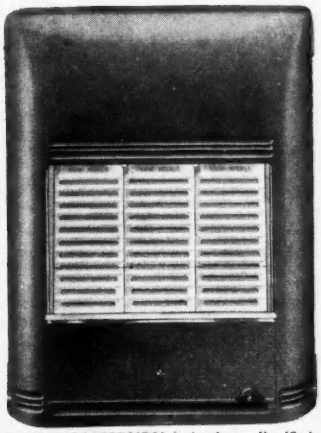
The report, signed by Sir Leslie Boyce and dated October 13, states that as a consequence of nationalisation the four Director members of the Committee of Management, including Sir Leslie himself, cease to hold office as from November 1. It is assumed that the new employing authority, the South Western Gas Board, will appoint employers' representatives in their place.

At the close of the accounting period, a total of £14,705 belonging to the scheme was invested in the Gloucester Gas Light Company. Holdings of £10,240 consolidated ordinary stock and £3,000 redeemable 3½% debenture stock will be converted into £15,544 British Gas 3% stock. Valuation of the 4% perpetual debenture stock (of which the scheme held £2,000) had not been agreed at the time the accounts were closed.

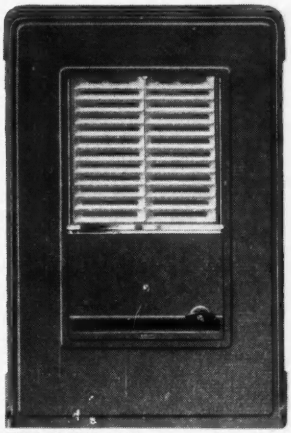


At the Bury St. Edmunds Trade Fair, to which we referred in our issue of November 23, R. & A. Main, Ltd., showed this working installation of the Main G.L.C. Circulator fitted to give a complete domestic hot water service. Alongside is shown a Main No. 177-14C cooker.

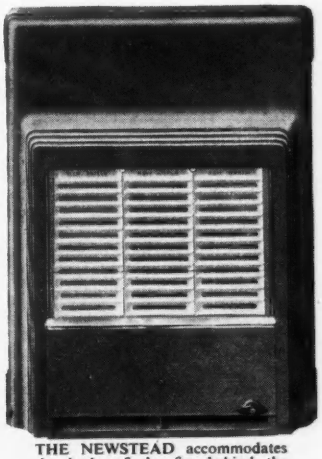
The next meeting of the Midland Association of Gas Engineers and Managers will be held on January 19, at the Queens Hotel, Birmingham. This date has been substituted for December 15.



THE MALMESBURY design has a dignified simplicity that has given it wide popularity. Made with two or three Rado-Panels.



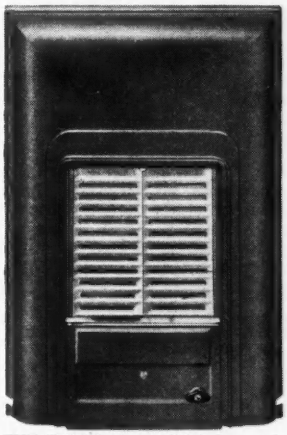
THE BUCKLAND gives the effect of the panel type of fire in a hearth-type setting Made with two or three Rado-Panels



THE NEWSTEAD accommodates the body of the fire behind the surround, in the wall thickness or existing chimney breast, so limiting the floor space needed for the hearth. Made with two or three Rado-Panels.

all settings

SILENT BEAM

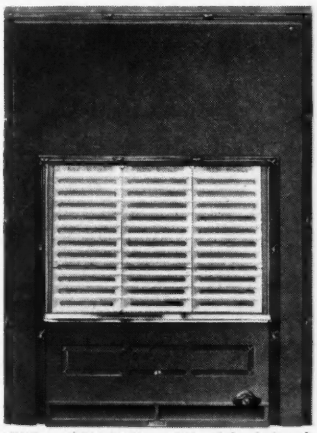


THE CERNE. A graceful design, made with two or three Rado-Panels.

position tap which enables the user to regulate the heat output in steps according to need. A gas governor is provided to adjust and control the gas pressure and so effect economy in use.

An automatic ignition device, provided on most types, makes lighting easy.

Silent Beam Gas Fires can be supplied in a range of attractive colour finishes, providing a choice to tone with most schemes of decoration.



THE HEXHAM. This plain design is suitable for any style of interior. Available with two or three Rado-Panels.

Showrooms & London Offices: 7 & 8 *Stratford Place, W.*1. (*Phone: MAYfair* 6462)

NEW WORLD NEW WORLD NEW WORLD

TRADE NEWS

A stand featuring products of **Keith Blackman, Ltd.**, now occupies a site at the Engineering Centre, Sauchiehall Street, Glasgow. The exhibits, include a model of the new T.1100 dust exhausting and collecting unit; a working one-tenth scale model of a 90 in. axial mine fan; propeller fans; axial fans; a 6 in. Extravent fan; sections of heater headers and tubes for air heaters, and a selection of industrial gas equipment.

Wolf Electric Tools, Ltd., announce the introduction of a new 4 in. electric hand grinder, the result of extensive studies and many years of specialised experience in this class of work. It weighs only 12¼ lb. and has ample power to maintain the correct surface speed on all grinding operations. The streamstyled shape results in faster working, improved dressing and finish, and a reduction in 'end of shift' fatigue when used on long production runs.

A brochure on Noral aluminium conduit, which includes details of its characteristics in installation and in service, has been issued by the **Northern Aluminium Co., Ltd., Banbury, Oxon.** As a substitute for steel in electric wiring systems it is claimed that it has many advantages —easier handling, setting, and screwing, and greater durability. Guidance is given on the adoption of correct installation technique, which differs from that applied when steel conduit is in use.

The 75th anniversary of the foundation of **Earle, Bourne and Co., Ltd.**, manufacturers of metal tubes and sections, has been commemorated by the publication of a special booklet. In addition to a short history of the firm, the booklet contains a number of illustrations of the various processes employed in the manufacture of the Company's products, which include solid drawn brass and copper tubes for the gas industry. Useful information for permanent reference is also given in the form of tolerance tables for light gauge copper and other tubes, conversion tables and factors, and lists of weight per foot of tubes of varying thickness. Copies of the booklet are available from the Company at Heath Street South, Birmingham, 18.

Details of the Radiovisor industrial smoke indicator, for installation in generating stations and industrial boiler houses, have been published by **Radiovisor Parent, Ltd.**, Stanhope Street, London, N.W.1. The equipment comprises four units—the projector, projector transformer, receiver, and control unit, the latter incorporating some form of external indicator, recorder or alarm. The projector and receiver may be spaced apart at any distance up to 40 ft., while the control unit may be situated a considerable distance away, for example, in the boiler house. The projector and receiver are capable of operating without deterioration in temperatures as high as 135° F. With this indicator the smoke density is known before it reaches the top of the stack, thus permitting a speedier operation of the controls.

Horsley Bridge & Thomas Piggott, Ltd., Constructional Engineers, Tipton, announce that their London office is now at 9, Victoria Street, S.W.1.

The gas plant works of **R. and J. Dempster, Ltd.**, at Manchester, were opened on October 1 for an inspection by staff and works employees in company with members of their family or friends. Guides were available to conduct the various parties through the works and explain the different types of machines and equipment. At the end of the tour the guests, numbering over 300, were provided with refreshments in the canteen.

Radiation Ltd., have published an eight-page pictorial record showing a typical example of the part played by their New World gas cooking and water heating appliances in the equipping of housecraft centres for new secondary schools. The pictures, which were taken at Sutton St. Joseph's school at St. Helens, Lancashire, illustrate the installation and practical school use of New World cookers, Eagle solid fuel range, and Phantom gas iron sets.

We have received from **Radiant Heating, Ltd.**, 9, Barnsbury Park, London, N.1, two leaflets describing the Millitherm gas-heated towel rail and the Radiant Heat gas salamander, respectively. The towel rail has the advantage of a very low running cost per week, and is supplied complete with floor fixing flanges, gas governor, and burner. The latest type of salamander effects an economy in gas of between 30% and 50%, and claims as its greatest feature instantaneous heat on being lit.

Clough (Croydon), Ltd., have issued an introductory leaflet on their new product, the 'Oxybar' tinning stick, claimed to be the first of its kind in this country. By doing the work of cleansing agent, flux, and tin in one simple operation, the stick effects a substantial saving of time, labour and heat. The operator does not have to pause during the tinning operation to bring fresh materials into use. The 'Oxybar' is produced in two grades, one with pure tin, suitable for all classes of work, and the other with a tin-lead content for general workshop use but not suitable for use on food utensils.

GAS UNDERTAKINGS' RESULTS

City of Waterford Gas Company

Net profit for the year ended June 30 was £2,113, compared with £2,353 for the previous year. A final dividend of 2½% makes 5% for the year, the same as for the previous year, leaving a sum of £67 to be carried forward, against £158 brought in.

Gas Supply Company (Melbourne)

The accounts for the year ended June 30 show a profit of £22,351, against £24,277 for the previous year. A dividend of 4% has been declared, leaving £3,528 to be carried forward, compared with £3,297 brought in. In his report, the acting Chairman, Mr. F. P. Derham, says that sales of gas were well maintained, although affected by coal strike conditions in the latter part of the year, and over 3,000 gas appliances were installed, compared with approximately 2,500 in the previous year. The poor quality of coal has been reflected in the lowest gasmaking quality on record, and its high ash content has meant a reduced quantity of coke.

Stourbridge

In his report for the final year of municipal ownership of the Stourbridge undertaking, Mr. S. J. D. Williams, Engineer and Manager, records a total make of 866,989,000 cu.ft. and total sales of 782,707,200 cu.ft., or 90.28% of the make, leaving 1.97% used on works and offices and 7.75% unaccounted for. Although receipts from sales of gas and residuals showed an increase of £31,401, the cost of manufacture and distribution increased still more, and the profit on revenue account fell from £15,139 to £13,240. Over six miles of new mains were laid during the year and considerable expenditure was incurred in maintaining the plant in a reasonable state of efficiency to meet increased gas demands.

South Australian Gas Company

Presiding at the annual general meeting, Mr. F. G Scaife announced a continued expansion of the company's business. The number of consumers increased by 1,420 to 82,604, a record, and gas sold amounted to 1,856,785,600 cu.ft., a further record, representing an increase of 6.2% on the previous year. Total revenue at £1,141,208 was £172,803 greater than last year and the highest in the history of the company. Increase in revenue, however, was almost wholly offset by higher operating costs. There was a continued upward trend in the price of coal and supplies; wages and salary rates also advanced. Coal used averaged 67s. 1d. per ton, compared with 50s. 11d. in 1948, and only 25s. 4d. pre-war. Coal, oil, &c., increased by £129,097, and other works charges by £38,727, increasing the cost of gas manufactured by 21.7%. Distribution and management expenses showed an increase; interest remained the same, while the allocation to special purposes fund, and depreciation for works on leasehold land were £34,504, against £38,359 for the previous year. The net transfer to profit and loss account was £87,132, and after providing for the year's dividend at 5%, the carry-forward increased to £62,478. Works plant was maintained in good condition, £65,459 being expended during the year on repairs and maintenance. Nine miles of mains were laid during the year, increasing the total length to 1,025 miles. Showroom sales activities were maintained and the value of appliance output at £263,749 was the highest yet recorded.

Underground Gasification

Experiments Near Chesterfield

UNDERGROUND gasification is to commence in this country. This news was released at a Press conference held by the Minister of Fuel and Power at Nottingham on November 24, and was widely published by the national Press. We are now able to throw more light on this interesting matter and to assess its significance and possible contribution to future fuel economy.

In the first place, it cannot be too strongly emphasised that this is a purely experimental project; it is, in fact, a laboratory experiment in the open air. The experimenters, the Scientific Advisory Council of the Ministry of Fuel and Power, are naturally hopeful that the result of this investigation will be sufficiently encouraging to permit further experiments on a larger scale and, ultimately, full-scale operations with a definite and economical return, but at present they are taking a cautious view. The venture, they say, may be useless, or it may not be sufficiently successful to constitute a reasonable proposition. Two or three months will give the answer.

The work is to start on an opencast site (Newman Spinney) near Chesterfield. The choice is easily understood when it is explained that this area is scrub and not agricultural land, and is almost unique in having the face of one coal seam already exposed by opencast working and likely to remain so for several months, while a lower seam is being worked. This should ensure that the experiments, which will be carried out on the upper seam, will not delay the restoration of the site after the opencast work has been completed. The Fox Earth seam, which will be the scene of the first experiment consists of an upper leaf of the good coal about 18 in. thick under which there is dirt inter-banded with thin coal layers, the whole being quite unsatisfactory for mining by normal methods. Up to about 200 ft. in from the actual outcrop this seam and its overburden have been removed by opencast working to allow access to a better seam (the Sough) some 50 ft. lower.

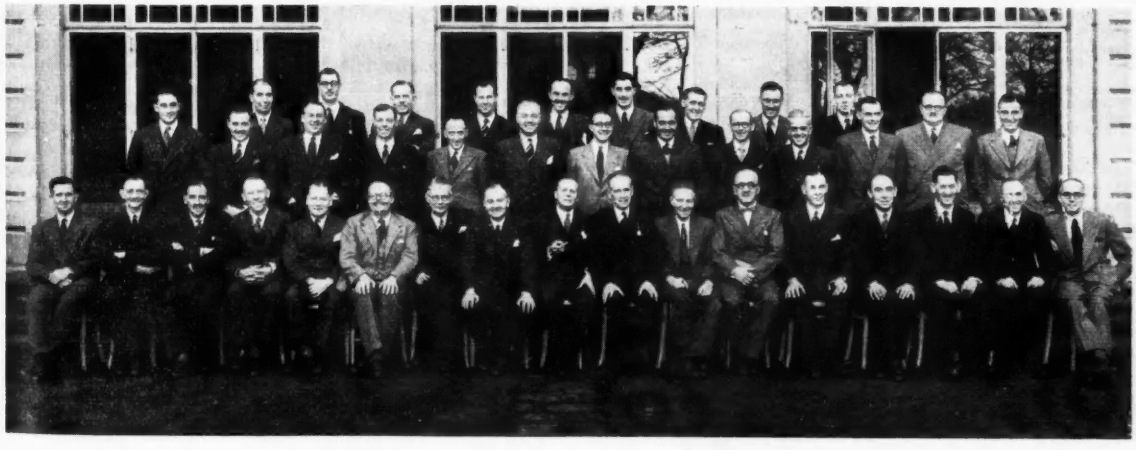
The procedure to be followed is comparatively simple. A 4 in. borehole is to be drilled into this face and within the coal seam which slopes downwards. The far end of this borehole, about 250 ft. from the face, will be about 80 ft. below the surface. A vertical borehole will be drilled from the surface to connect with the end of this lateral hole, and a second vertical will be drilled also to connect about 50 ft. nearer the exposed face. The lateral hole will then be sealed from this point to the face, leaving a clear channel for air down one vertical, through the coal and up the other vertical. The coal near the base of one vertical will be ignited and air draught maintained through the system by a compressor. It is hoped by control of the rate of air flow, and possibly by using steam, to produce combustible gas and sensible heat at the off-take.

There are several snags. Most obvious is the possibility of the roof cracking and the gas leaking through the resulting vents. Moreover, the hopes, expressed in some quarters, that underground gasification would yield a gas suitable for mixing and distributing with town gas, are not likely to be fulfilled by this experiment. It is anticipated that any gas withdrawn from this seam will be of extremely low calorific value. If, by the end of March, gas of 50 c.v. can be obtained, the experimenters will be well satisfied. Their intention is to turn this into power, not to use it as a base for chemical products or the basis for a gas grid. The advent of the gas turbine with its capacity to use low calorific value fuels would seem to be the solution. It is possible, of course, that these experiments may yield a high calorific value gas, but it seems improbable; the important point is that even if the calorific value is low, the process may still be worth while from an economic standpoint. It is hoped to be able to gasify all the coal, leaving no coke behind.

It is, perhaps, dangerous to peer too far into the future, but certain possibilities may reasonably be considered. For example, if the calorific value of the gas proves to be satisfactory, obviously the generating plant would have to be more or less portable in order that it may be moved when areas become exhausted. The method appears to lend itself to areas such as that selected for the present experiments, areas which it would not be practicable to mine normally.

Whatever the outcome, considerable credit is due to the Scientific Advisory Council of the Ministry for undertaking such pioneer work in this country. Fortunately, the results, at least of the initial experiment under review, will be known very shortly. It is hoped to commence serious drilling this month and to achieve conditions favourable to ignition and subsequent gasification before the end of January. A formal report will then be submitted to the Council, which will determine on what lines future work will proceed—if at all.

The immediate cost of the experiment will be £3,000 per month, and the work is proceeding under the direction of Mr. C. A. Masterman, until 1947 Chief Technical Officer at Watson House, with staff drawn from the Safety in Mines research establishment. It is hoped that by means of high pressure air injection it may be possible to force gas through the seams, thus dispensing with the necessity for establishing horizontal connecting airways.



The above photograph was taken at the annual sales conference of Donald Macpherson and Co., Ltd., which was held at the Palace Hotel, Buxton, on November 18. Thirty-six members of the internal and external sales departments of the Company attended the conference, at which the Deputy Managing Director, Mr. S. W. Chester, presided. A visit was made to the Warth Mill Works, Bury, which have been acquired by the company to co-ordinate and extend its manufacturing capacity.

TREATMENT OF EFFLUENT LIQUORS FROM GASWORKS*

By JAMES J. PRIESTLEY, M.Sc., M.Inst.Gas E., A.M.I.Chem.E.,
W. C. Holmes & Co., Ltd.

(*Continued from page 539*)

SEGREGATION of retort house liquor is suggested by Key, and, also, separate storage of tar and liquor. One of the most important findings of the Liquor Effluents Committee was that the practice of electrostatic detarring of hot gas reduced the higher tar acid content of liquor by about 75%. By removing tar from the gas in this way at an early stage, contact with the liquor was very much reduced and also the H.T.A. content of the liquor. Phenols, on the other hand, passed forward into the liquor, condensing along with the water, so that their concentration and incidentally the O/A of the liquor were actually greater than before. An increase in phenol content would be advantageous if the liquor were subsequently treated for their removal. If the liquor were not so treated, phenols are handled easily at a sewage works, in contrast to the difficult and colour-producing higher tar acids.

Thiocyanate and thiosulphate, as already mentioned. are formed by the oxidation of sulphides by oxygen in the gas. To keep these at a minimum, air should not be added to the gas at any point preceding the purifiers and the time of contact between gas and liquor in ammonia scrubbers should be kept as short as possible. Oxidation also occurs during pumping and storage of liquors with exposure to air, but the net effect on the oxygen absorption value is doubtful.

The points mentioned in this section may appear unspectacular, but are usually easy to apply and can contribute materially to the reduction of the effluent problem.

(2) Liquor Treatment at Gasworks prior to Sewage Works Treatment

The treatment of liquors at a gasworks prior to discharge into sewers is usually done for financial reasons. First, treatment may create a profit by producing a saleable commodity such as concentrated ammonia liquor. In this case the improvement of the discharged effluent liquor is incidental and secondary. Alternatively treatment may be carried out to avoid heavy payments to the sewage authority, in which case the production of a saleable commodity is incidental. Local conditions determine which of these views is applicable to any particular works.

TABLE 1.

Constituent	O/A	Toxicity	How oxidised (biochemical)	Un-desirability
Free ammonia ...	Nil	High	Very slowly	1
Fixed ammonia	Nil	Nil	Very slowly	3
Sulphide ...	1,345	High	Easily	2
Thiocyanate ...	827	High	With difficulty	1
Thiosulphate ...	856	Low	Easily	3
Phenol	1,780	Medium	Easily	3
'H.T.A.' ...	High	Low	Very slowly or not at all	1

(i) *Free Ammonia Removal.* Referring to Table 1, it will be seen that the most undesirable constituent of an effluent liquor is free ammonia, because, apart from its slow oxidising properties. it is the largest. Removal of free ammonia is relatively easily achieved by distillation of the liquor, and as it is widely practised in the industry details need not be discussed here. During the distillation process not only ammonia but sulphide and a portion of the monohydric phenols are volatilised from the liquor. There is also a dilution effect due to the condensation of steam. The combination of these last three items is responsible for a considerable improvement in the composition of the effluent liquor, which may be measured by the diminution in the O/A value. It is emphasised, however, that the true improvement of liquor composition achieved by stripping out the free ammonia is not shown by the diminution in O/A value. The real improvement is much greater.

*Paper to the Scottish Junior Gas Association, (Western District), November 18, 1949.

Oxidation of ammonia to nitrates and water requires theoretically 4.24 gm. O_2/gm.NH_3. If now we regard this as, say, an 'ultimate oxygen demand' a different picture emerges. Take as an example Key's analyses ((4)p.18).

	Ammoniacal liquor to still	Spent liquor
O/A (4 hr. at 27° C.) due to :		
Sulphide	298	Nil
Phenols...	616	474
Thiosulphate	117	103
Thiocyanate	201	127
'H.T.A.' (diff.)	556	478
Total	1,788	1,182
%	100%	66.3%

Assume that for the above constituents, the 'ultimate oxygen demand' is the same as the O/A. Now add the 'ultimate oxygen demand' of ammonia. At 4,240 p.p.100,000/gm. NH_3/100 c.c. this becomes

Ammoniacal liquor (1.99% NH_3) = 8,420 p.p. 100,000
Spent liquor (0.039% NH_3) = 165 p.p. 100,000

Key's figures now become :

	Ammoniacal liquor	Spent liquor
Total as above	1,788	1,182
Add for NH_3	8,420	165
Modified total	10,208	20,347
%	100%	13.2%

The reduction in the 'ultimate oxygen demand' is 86.8% as against the O/A reduction of 33.7% which, although it is not strictly justifiable, gives a truer picture of the degree of improvement achieved.

(ii) *Fixed Ammonia Removal.* The practice of decomposing fixed ammonia during distillation by lime has declined in recent years. Considering ammonium chloride only (the largest 'fixed' constituent) this is not particularly troublesome to sewage authorities, so that the removal of this salt makes little difference to the problem of effluent treatment. Usually recovery is practised for other reasons, and for the fact that ammonium chloride is a saleable commodity.

Either flushing liquor or still effluent liquor may be used as the starting material. Holton at Manchester used flushing liquor, reference to which has already been made. Circulation was continued until the ammonium chloride concentration reached 14-18% after which final evaporation was carried out in a double effect vacuum evaporator. The final salt was crystallised from the mother liquor and was marketable (8).

Still effluent liquor was treated in a quadruple effect evaporator as early as 1934 at the by-product plant of Stewarts & Lloyds, Corby (10).

(iii) *Sulphide.* As previously stated this may be removed during distillation of the liquor as a constituent of the dissociator gases. The gases are vented either to the crude gas main or to an oxide box.

(iv) *Thiocyanate and* (v) *Thiosulphate.* No feasible commercial methods for the removal of these salts are known. Regarding thiocyanate, the relatively low concentration in the liquor and the uncertain market have made its recovery uneconomic. Various patents have been granted, notably one in which precipitation as cuprous thiocyanate was the method of separation used.

(vi) *Monohydric Phenols.* There are many commercial processes for the removal of phenols. There are probably three main reasons for this:

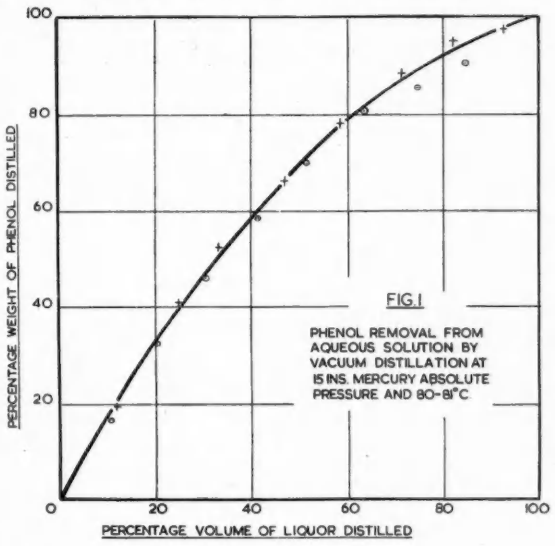
(1) Monohydric phenols are easy to remove from liquor.
(2) The recovered phenols have a good market value, so that the revenue obtained is usually at least equal to the cost of operating the process.

(3) Phenol removal results in a considerable reduction in the O/A value of the liquor treated. This is important when waste liquors are assessed by sewage authorities on an O/A basis.

As has previously been stated, phenols are also fairly easy to oxidise at a sewage works, and Damon, commenting on a statement that certain manufacturers wished to treat effluents for the removal of such offending substances as could be easily and cheaply removed, said he supposed that meant leaving for the local authority those substances which were more difficult and expensive to remove (11). There is no gainsaying this statement, but the fact remains that, in those localities where one unit of O/A is considered as good as (or bad as) another, point (3) above will still remain valid and important. Phenol extraction is of German origin, where the problem at coke works was to treat effluents high in phenols but low in other impurities, before direct discharge into rivers ((4) p. 74). There are in addition to these, plants working both in this country and the U.S.A. Methods available may be grouped thus:—

(a) Vaporisation.
(b) Solvent extraction.
(c) Active carbon absorption.

(a) *Vaporisation.* Monohydric phenols are volatile in steam, hence their partial removal in the production of concentrated ammonia liquor. Fig. 1 shows results obtained in



Holmes' laboratory. In the United States, the Koppers vapour recirculation process has had a wide application. In this process (12) liquor stripped of its ammonia and acidic gases is treated with a continuously recirculated current of steam which vaporises the phenols. The steam is afterwards washed with hot caustic soda solution which absorbs the phenols, the phenol free steam being sent back to treat more liquor. Phenols are recovered by acidification of the phenolate by carbon dioxide. This process does not remove polyhydric phenols because they are not sufficiently volatile in steam.

(b) *Solvent Extraction.* This is by far the largest and most important group of processes. In principle, ammonia liquor is washed with a solvent which will dissolve the phenols. These are subsequently separated from the solvent either by distillation or by treatment with caustic soda solution. Benzole, light tar oils, tri-cresyl phosphate, and recently butyl acetate have all been used on a commercial scale as solvents.

Two plants operating on benzole as a solvent have been installed by Holmes in this country. One was installed at Partington (Manchester) in 1931 and has been described by Holton (13). This plant is still in operation. The other was installed at the Provan chemical works, Glasgow, in 1934, but has been shut down since the early days of the war. In both plants washing of the liquor is carried out in a counter current tower washer. The solution of phenol in benzole is distilled at atmospheric pressure to effect a separation, the benzole being evaporated and condensed to be used again, the crude phenols being left behind as a residue. The small proportion of benzole dissolved in the liquor was originally recovered in active carbon filters, but these are not operating at the present time. The average O/A reduction obtained was about 60%.

Murdoch and Cuckney have given an account of a plant installed at the Beckton products works in which light creosote oil was used as the solvent (11). Here both the washing of liquor by the solvent and the washing of the solvent by caustic soda was carried out in a series of small counter current washers, the arrangement being adapted from the Holley-Mott system which is used in the petroleum industry.

Tricresyl phosphate has been used as a solvent. While being a better solvent than benzole, it deteriorates in use and, being less volatile than phenols, remains behind in the still during the vacuum distillation process used for separating the two, and consequently accumulates heavy tarry matter originating in the liquor ((1) p. 1,450).

The use of butyl acetate was developed during the war in Germany and was known as 'Phenosolvan' (14). This solvent has a high partition co-efficient not only for monohydric, but for polyhydric, phenols (*i.e.*, 'higher tar acids'). This will be dealt with more fully later.

(c) *Active Carbon Absorption.* Active carbon can be particularly effective in removing monohydric phenols from liquor, which must be clean and free from tar and suspended matter. Extraction is usually carried out at 60°C. and continued to the 'break point,' after which the carbon is washed with benzole at the same temperature, to remove the carbon-held phenols. Afterwards the benzole is drained off and the filter steamed to remove the last traces of benzole (15). Care is required when the liquors undergoing treatment contain gum forming bodies (probaby resembling the so called 'higher tar acids') otherwise these will render the carbon inactive.

(3) Complete Disposal of Liquors at Gasworks

It is doubtful whether any gasworks has disposed entirely of its own effluent, because complete disposal is usually a difficult and expensive business. It is usually easier and acceptable to improve the quality of an effluent as much as possible, then pass on the effluent to the sewage works. Again the economic factor is the ruling one.

More than passing reference is due to the labours of the Liquor Effluents Committee who investigated the possibilities of bacterial oxidation at the gasworks itself (17). Large scale tests were carried out at Coventry on the purification of 40,000 gal. per day of spent liquor on a plant which included four sprinkling filter beds each 120 ft. diameter constructed actually at the Foleshill works. The beds were first activated with diluted sewage and then liquor was added in a small stream which was slowly increased until spent liquor only was being treated. This had to be diluted by recycling of purified effluent, the recycle volume being 23 times the feed volume. This work was discontinued as it was considered expensive both in capital and in operation. Biological treatment was considered best carried out at a works designed for the purpose—*i.e.*, a sewage works. It was considered doubtful whether bacterial treatment at a gasworks did materially lessen the burden of a sewage works. ((4) p. 77).

The other methods available are what might be termed as those of destructive evaporation. Evaporation in gas producers is quite feasible, but only 16 gal. of liquor per ton of coal carbonised may be disposed of in this way. Spent liquor is not difficult but retort house liquor causes trouble. Attempts to increase the evaporation rate to a figure greater than 16 gal./ton causes extra fuel to be consumed at a lower efficiency, so that the cost of evaporation in this manner may be excessive. Dr. Key, writing in 1938, gave the cost as likely to exceed £1 per 1,000 gal. ((4) p. 60).

Evaporation at the base of chimney stacks may be used provided the evaporator trays do not interfere with the operation of the chimney and the effluent gases are not cooled below their dewpoint.

Effluent liquor has been used for coke quenching, but statements regarding its effect on coke quality are conflicting. It is certain, however, that corrosion of ironwork is increased and there is likelihood of a nuisance from smell ((1) p. 1,421).

A new approach had to be sought, again because of economics, by the designers of new centralised gasworks or coke ovens. Usually such works are located at some distance from large centres of population, and the discharge of the effluent into a small local sewage system could not be tolerated. In other words, the proportion of effluent to domestic sewage would be much greater than the normal value (which is usually 0.5—0.75% as ammonia free liquor) and the extra load imposed on the sewage works several times the one for which it was designed. While the sewage authority could not refuse to take such an amount of effluent, it is empowered to make such charges as would cover extra capital outlay and operating costs, which could be extremely heavy.

This problem arose when the by-product coke oven plant of Stewarts and Lloyds was erected at Corby, Northamptonshire. A large volume of an effluent liquor was produced in a works which was set down in a completely rural area. The liquor was treated by a system of effluent disposal which may be regarded as unique. The stages in the process may be given as follows:—

(1). *Ammonia Distillation.* Free ammonia was distilled off and converted into ammonium sulphate.

(2). *Dephenolation.* The solution of fixed salts of ammonia was stripped of phenol by the Koppers vapour recirculation process (*q.v.*) with the production of crude phenols.

(3). *Evaporation.* Phenol-free effluent was evaporated in a quadruple effect evaporation plant with the production of ammonium chloride. Mother liquor was pumped away and mixed with water used for coke quenching.

Later the plant was enlarged to correspond with the larger carbonising capacity (with the exception of the dephenolation plant) until the output was 4-5 tons per day of ammonium chloride from about 3,000 gal. of liquor per hour (Fig. 4). Problems of corrosion and colour of the salt were successfully overcome (10). Using existing processes a new scheme described by Nicklin (16) has been worked out for the complete disposal of effluent from a large new works, to which further reference will be made later.

New Developments

Modern development has followed two distinct lines, first, the removal and recovery of all the phenolic bodies present in liquors and secondly, the complete disposal of liquor and the recovery of marketable products. Four full scale plants, two for phenol recovery and two for effluent disposal are being built by Holmes, one of which is now actually under construction. These two groups are discussed separately.

(1) Phenol Recovery using Butyl Acetate as a Solvent

Butyl acetate was the main constituent of a group of esters used by Lurgi for the extraction of phenols from brown coal low temperature carbonisation liquors. Extraction of these liquors by ordinary hydro-carbons, such as benzole, was unsatisfactory because a large proportion of the dissolved phenols were polyhydric, which are not easily soluble in benzole. Partition coefficients of the two solvents are as follows (18):

Solvent	Partition Coefficients	
	Phenol	Catechol
n-butyl acetate	48.1	10.6
Benzole	2.6	0.5

(i). *General Properties of Butyl Acetate, $CH_3COOC_4H_9$.*

Butyl acetate is a colourless volatile liquid, Sp.GR.0 882 at 15.5°C. having an odour of pear drops. Its boiling point is 126.5°C. at 760 mm.H, and its latent heat 133.0 B.Th.U./lb. at 124.0°C. (19). It is soluble to the extent of 0.8% by volume in water, and 2.4% by volume of water will dissolve in it. It is decomposed very slowly by caustic ammonia to acetamide and a butyl alcohol:

$$CH_3.COOC_4H_9 + NH_3 = CH_3\,CO.NH_2 + C_4H_9OH$$

(ii). *Comparison of Benzole and Butyl Acetate Dephenolation*

(a). *O/A Reduction.* It will be noted that besides having a high partition coefficient for catechol, butyl acetate has a high coefficient for phenol as well. Therefore one would expect that the O/A reduction would be greater after washing with butyl acetate than benzole. Laboratory experiments confirmed this, when liquors were washed with small quantities of solvent until no further O/A reduction was noted:—

TABLE 2.

COMPARISON OF BENZOLE AND BUTYL ACETATE

Liquor origin	O/A values p.p. 100,000				
	Before washing	After benzole wash	% reduction	After B.A. wash	% reduction
1. Storage well, works Y ...	1,738	437	75.0	374	78.4
2. Storage, vertical retort liquor, works L ...	1,485	564	62.1	383	74.3
3. Effluent from concentrated liquor	1,320	367	72.1	248	87.3
4. Effluent from concentrated liquor plant, works S...	1,080	—	—	185	83.0

(b). *Steam Requirements.* The second large advantage of butyl acetate is that because of the high partition coefficients a much smaller volume of solvent is required. With countercurrent benzole extraction the ratio of liquor : solvent is usually 100 : 70 by volume. The corresponding ratio with butyl acetate is 100 : 12.5. Hence a correspondingly smaller amount of steam is required for the final separation of the phenols and solvent, and the whole of the distillation plant is proportionally smaller.

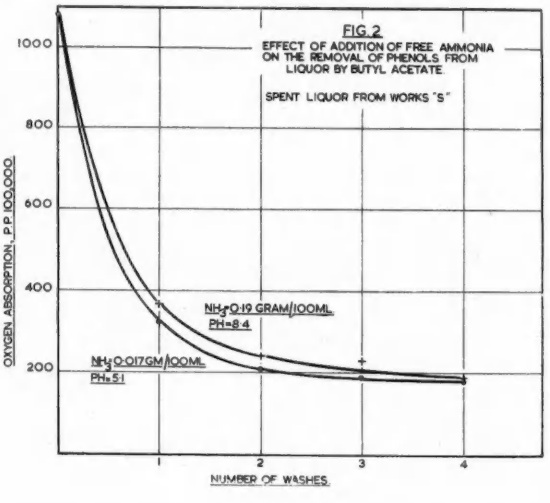


TABLE 3.

COMPARISON OF STEAM REQUIREMENTS FOR SOLVENTS

	Benzole D/P	Butyl acetate D/P
Vol. liquor/hr., gall. ...	1,000	1,000
Vol. solvent/hr., gall. ...	700	125
Steam for phenol separation, lb./hr. :		
(*a*) Live	1,350	300
(*b*) Exhaust	2,250	Nil
Steam for solvent recovery (exhaust)	Nil	840
Total steam lb./1,000 gall. liquor	3,600	1,140

Butyl acetate is, however, slightly soluble in water, about 0.8% by volume. Hence, after washing, the liquor must be treated for its recovery. This is usually carried out by steam distillation where the dissolved ester and some water are vaporised, condensed, and separated, the butyl acetate being returned to storage.

(To be continued)

GAS METERING

A properly installed Meter meets the requirements of British Standard Code of Practice, C.P.331.102 and of course it has

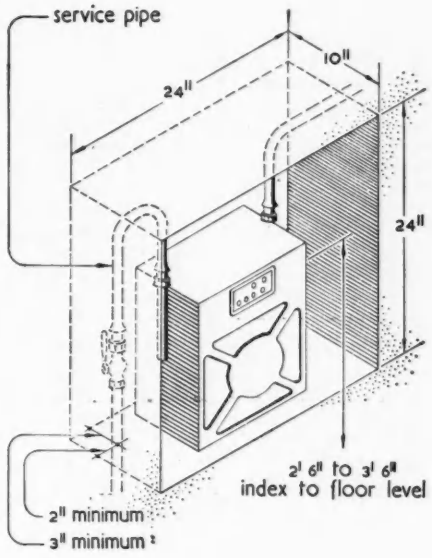
Lead pipe connections

A good arrangement for meter housing is to provide a small compartment inside the building. This should be in a position of easy access without disturbing the household, and as near as practicable to the point where service pipe enters the building.

Meter compartments should be dry, well ventilated and made of fire resisting material.

Positions to be avoided are : above cooking or heating appliances, in larders or food stores, under draining boards or adjoining sinks, where there is likely to be a wide variation in temperature.

If a single compartment is to be used for both gas and electricity meters and their controls, a fire resisting and non-conducting partition should be fitted between them.



The Technical Information Bureau of the Lead Industries Development Council, which exists to give assistance on problems relating to the use of lead sheet and pipe in building work, will be pleased to give advice on any questions relating to the uses of the materials.

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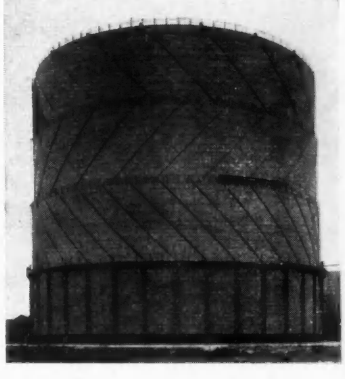

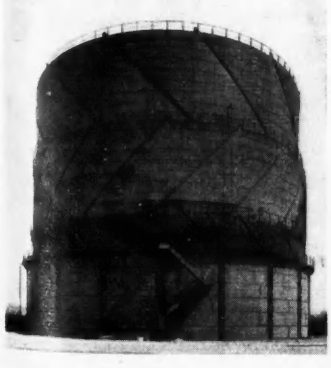

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The **Northern Aluminium Co., Ltd.,** Banbury, Oxon, has produced an illustrated booklet describing the use of aluminium in patent glazing. Puttyless glazing systems, it is stated, have largely superseded others for large runs of roof lights. The advantages of aluminium for the glazing bars employed are set out, and a number of the many patent systems is listed and illustrated.

The latest product of the **Rotolift Sales Company,** a lever-operated lifting device, is the subject of a leaflet available from the Company at 2, Robert Street, Adelphi, W.C.2. With a weight-size to power ratio of 17 lb. to three-quarters of a ton, and measuring only 20 in. × 4½ in. × 5½ in. when packed, it is claimed that this general-purpose tool makes 'the block and tackle as old-fashioned as the horse cart.' The 'Rotolift' can be used in any position for lifting or pulling and in the most confined spaces due to its small size and short hook distance of only 12 in. when close hauled. Other advantages are a 'micrometer' hook movement with the hooks mounted on swivel joints, and the absence of grease or oil as a lubricant.

A closer liaison has been established between **Bell's Asbestos and Engineering, Ltd.,** and **W. N. Baines and Co., Ltd.,** by the appointment of Mr. A. Thomson, Managing Director of the latter Company, to the board of Bell's. W. N. Baines and Co., Ltd., have worked with Bell's in the closest co-operation for over 50 years in the making of Victor valves, which carry a stainless steel valve and seat and have the glands packed with Bell's 'safety packs.' The Company have also made for Bell's over the same period asbestos packed water gauge fittings and blow down cocks for boilers. It is anticipated that the pooling of Mr. Thomson's specialised knowledge of steam and steam fittings with Bell's general connection with the engineering trade will prove of great value both to industry and the two firms.

Orders have recently been placed with **Kirkham, Hulett & Chandler Ltd.,** Gas Engineers, Mansfield, Notts., for overhead purifiers by the Scottish Gas Board for Armadale gasworks and by the North Western Gas Board, for similar plant at the Accrington gasworks.

A device which effects an instantaneous cut off of fuel to oil and gas-fired furnaces on flame failure is described in a new leaflet from **Elcontrol, Ltd.,** 28A, Tilehouse Street, Hitchin, Herts. The Elcontrol furnace safeguard basically comprises three items—a special heat-resisting steel probe which makes contact with the flame at a few inches from the burner, an electronic control unit situated at a convenient distance, and an electrically operated fuel supply valve controlled by a relay in the control unit. Unlike thermal or photo-electric safety devices, the apparatus is insensitive to radiant heat or the glow from hot brickwork.

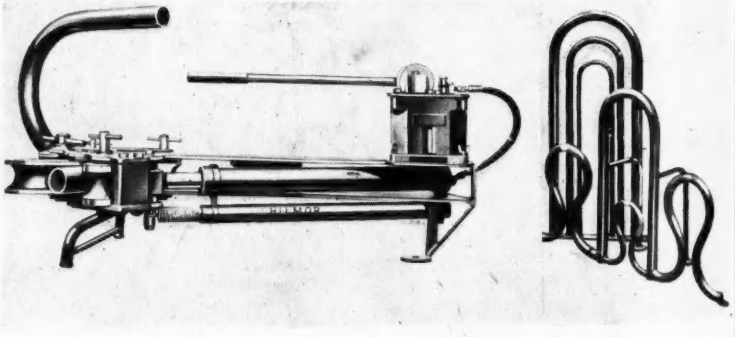
A booklet entitled 'Heat Exchangers and Condensers' has been published by **Ashmore, Benson, Pease and Co., Ltd.,** 39, Victoria Street, S.W.1. It provides details of the Rosenblad design of spiral plate heat exchanger, which has been in extensive use since 1930 and has proved to be a highly efficient apparatus for the transfer of heat from one medium to another. Among its many industrial applications is included its use in gas and coke plants. Features of the spiral heat plate exchanger are its high efficiency which contributes to compact design, low pressure drop with high heat transfer rate, controlled velocity in both passages with a resultant minimum of scale formation, high capacity/surface area ratio, low weight/capacity ratio, and utilisation of the entire heating surface. A reprint of the paper on 'The Recovery of Low Value Heat,' by A. Ahlstrom and A. Ullman, presented at the Institute of Fuel last year, is also available from the Company.

New Tube Bender

Hilmor, Ltd., announce a new addition to the Hilmor range of tube bending equipment. It is an entirely new type of portable hydraulic bender for use with heavy gauge gas and steam size tube.

This machine, which is designated the Hilmor 'Rotary' No. 2, transfers the straight thrust of an hydraulic ram into a turning movement about a tending former and it has been designed to overcome the widely recognised drawbacks and limitations of the conventional 'three-point' hydraulic bender.

The 'Rotary' No. 2 will produce true radius bends up to 220°, compound bends in similar and different planes, and is, in fact, as versatile in performance as the familiar Hilmor light gauge bending machines.



The Hilmor 'Rotary' No. 2 portable hydraulic bender, and, on the right, some typical examples of the work the machine is capable of handling.